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HON. L. P. BRODEUR,
Minister of Marine and Fisheries.

REPORT

ON THE

DOMINION OF CANADA GOVERNMENT EXPEDITION

TO

THE ARCTIC ISLANDS AND HUDSON STRAIT

ON BOARD THE

D. G. S. 'ARCTIC'

BY

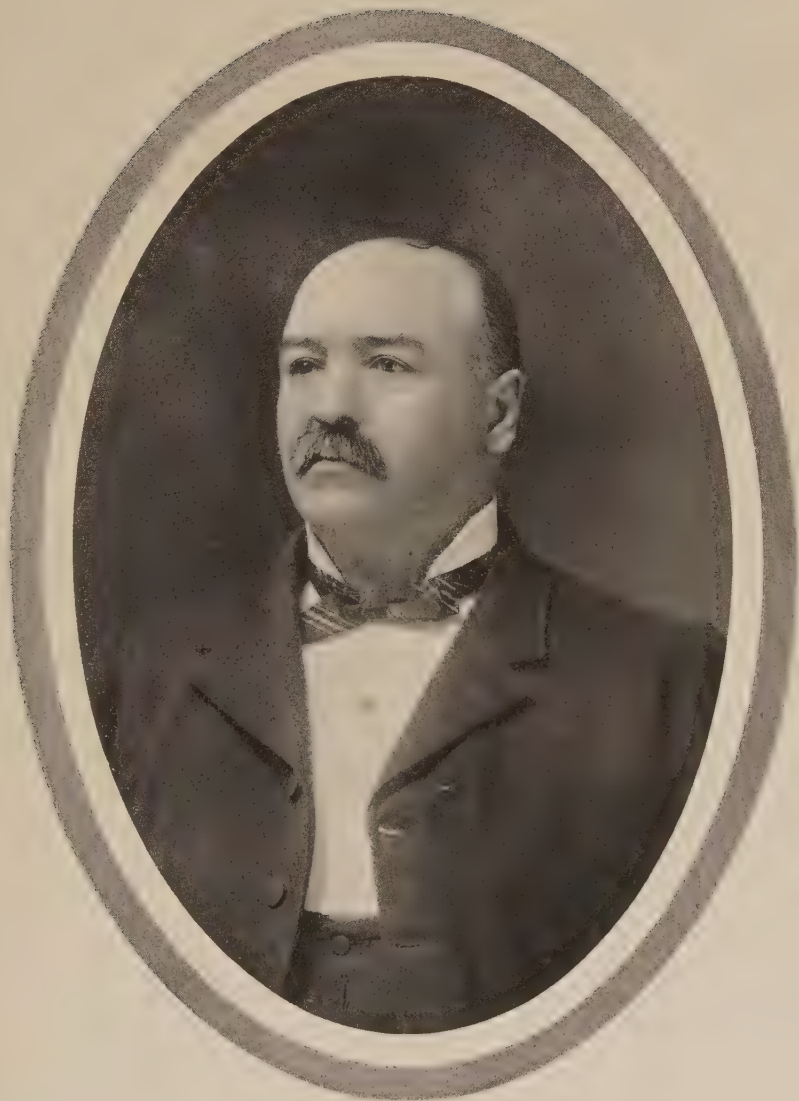
CAPTAIN J. E. BERNIER

Officer in Charge and Fishery Officer

OTTAWA

GOVERNMENT PRINTING BUREAU

1910



CAPTAIN J. E. BERNIER,
Commander of the 'Arctic' in Expedition of 1908-9.

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NOTE.—The illustrations in the report of Commander Bernier are from photographs by himself and from some sketches by Mr. Frank Hennessey. A few photographs by the Photographer of the Arctic Expedition of 1906-7 were also made use of. The illustrations in Mr. McMillan's report were photographs furnished by him.

LIST OF CHARTS AND MAPS ACCOMPANYING THIS REPORT.

- Geological Sketch Map.
- Map of Winter Harbour, 1909.
- Tracks of Mr. Morin and Mr. Green of the *Arctic* from Melville Island to Banks Island and Victoria Island.
- Beacons in Winter Harbour, Melville Island.
- Facsimile Track Chart H.M. Sledge *Success*, Barrow Strait, 1851.
- Discoveries in the Arctic Sea.
- Chart of Jones Sound.
- Facsimile of Arctic Discoveries, 1853.
- " Behring Strait, 1852.
- " Depot House, Dealy Island, Henry Kellett, 1853.
- " showing Winter Quarters of Franklin, Austin McClure and Kellett.

Hon. LOUIS-PHILIPPE BRODEUR,
Minister of Marine and Fisheries,
Ottawa.

SIR,—I have the honour to submit the report of the Expedition to the Arctic islands and Hudson strait by the Dominion Government steamer *Arctic*, under command of Captain J. E. Bernier, in 1908 and 1909.

I have the honour to be, sir,
Your obedient servant,

G. J. DESBARATS,
Deputy Minister of Marine and Fisheries.

DEPARTMENT OF MARINE AND FISHERIES,
OTTAWA, April 5, 1910.

OTTAWA, April 5, 1910.

G. J. DESBARATS, Esq.,

Deputy Minister of Marine and Fisheries,
Ottawa.

SIR,—I have the honour to submit my report of the voyage of the Dominion Government steamer *Arctic*, to the northern waters of this continent, for the purpose of patrolling the waters contiguous to that part of the Dominion of Canada already annexed, and for the further purpose of annexing territory of British possessions as far west as longitude 141 degrees.

I have great pleasure in mentioning that with the valuable assistance of the officers, staff and crew of the *Arctic*, I was able to successfully patrol and cruise in the following waters, viz.: Davies strait, Baffin bay, Melville bay, Smith sound, Lancaster sound, Barrow strait, Melville sound, McClure strait; and on returning to winter in Winter harbour, Melville island. During our stay at Winter harbour two parties were twice sent to Banks island and Victoria island to annex those islands and search for cairns erected by McClure, in which he left records. Leaving Winter harbour on August 12, 1909, we explored and sounded Byam Martin channel and Austin channel as far as Hotspur point, where we left records. We then sailed down Austin channel into Barrow strait, along Lancaster sound, and into Navy Board inlet and into Ponds inlet. From Ponds inlet, we patrolled the east coast of Baffin land with a view of meeting whaling vessels, two of which we met, and issued to them licenses. From there, we visited Cumberland gulf, issued four licenses to stations, and from that point sailed to Cape Haven in search of the wrecked crew of the *Snowdrop*. From Cape Haven we sailed to Port Burwell and then into Hudson strait as far as Ashe inlet, which we entered and constructed beacons;

returning from that point to Port Burwell, and from that harbour steamed along the Labrador coast to the Strait of Belle Isle, and thence to Quebec, where we arrived on October 5, 1909, all well.

Permit me to acknowledge the kindness of yourself, Rear-Admiral Kingsmill, Mr. T. Beland, agent of the department at Quebec, and Captain Edward English of St. Johns, Newfoundland, the last mentioned for engaging part of the crew at St. Johns and handing them their advances. The same attention was shown by officers of the department at Ottawa and Quebec, who assisted in the outfitting of the vessel. I also acknowledge the assistance rendered by Mr. W. W. Stumbles, of the department, who edited and arranged this report.

I have the honour to be, sir,

Your obedient servant,

J. E. BERNIER,

Commanding Officer of the 'Arctic' Expedition.

SHIP'S COMPANY.

OFFICERS.

Captain J. E. BERNIER, Commander.
 GEORGE BRAITHWAITE, First Officer.
 O. J. MORIN, Second Officer.
 C. W. GREEN, Third Officer.
 J. V. KOENIG, Chief Engineer.
 EMILE BOLDUC, Second Engineer.
 W. H. WEEKS, Purser.

SCIENTIFIC STAFF.

J. BOLDUC, Medical Officer.
 F. VANASSE, Historiographer.
 W. E. JACKSON, Meteorologist.
 J. G. McMILLAN, Geologist.
 FRANK HENNESSEY, Assistant Naturalist.

CREW.

GEDEON GAGNÉ, Carpenter.	J. GOULET, Waiter.
WILLIAM JOHNSON, Boatman.	THOMAS HOLDEN, A. B. Seaman
J. THIBAUT, Chief Steward.	THOMAS WHITE, “
I. BÉGIN, Cook.	DANIEL LANE, “
GEORGE LESSARD, Quartermaster.	SWEN ANDERSON, “
NAPOLEON CHASSÉ, Quartermaster.	WILLIAM LEBEL, “
ARTHUR DESJARDIN, Quartermaster.	ALPHE BOUCHARD, “
CLAUDE VIGNEAU, Quartermaster.	T. W. BURK, “
E. LAHAYE, Oiler.	JOHN SIMMS, “
A. BOURGET, Oiler.	WILLIAM DOYLE, “
A. ROBITAILLE, Second Steward.	HENRY WAKEHAM, “
W. VAILLANCOURT, Second Cook.	JOSEPH BÔDEKER, “
G. GROSELIN, Fireman.	JAMES BRACE, “
JOS. LECLAIR, Fireman.	LOUIS WISTLE, “
D. ROBSON, Fireman.	P. TREMBLAY, “
REUBEN PIKE, Waiter.	

PARTICULARS AND DIMENSIONS OF THE CANA-
DIAN GOVERNMENT STEAMER 'ARCTIC,'
TAKEN FROM THE CERTIFICATE
OF REGISTRY.

Class.—Highest class of Germanic Lloyds.

Material.—Best dry oak and pitch-pine.

When and where built.—1900-1, at the Howaldt's ship-
yard, Kiel, Germany.

Register tonnage.—Gross, 650 tons; net, 436 tons.

Capacity (including bunkers).—Two bunkers are on each
side of the engine-room, and the main hold, amidship and aft
in the between decks, holding in all 600 tons.

Length.—165·4 feet.

Main outside breadth.—37·2 feet.

Side depth from inner edge to upper deck beam.—22 feet.

Decks, upper deck and 'tween deck.

Depth laden.—21·6 feet.

Depth empty.—13·3 feet.

Water gates.—Two steel water gates to close engine-room
and boiler-room.

Hatches.—One in the fore deck and one in the after deck.

Rig.—Three-masted, top-sail schooner, fore-mast square
rigged. Special propellers.

Auxiliary engine power.—Triple expansion engine with
surface condenser, ind. h.p. 275. Boiler built, 1900-1.

Speed when laden.—Five knots.

Steam winches.—Two.

Electric light.—Good electric unit with engine attached,
steam for engine from the main boiler.



H. M. C. S. *Arctic*.

LIST OF SOME OF THE TERMS USED IN ICE NAVIGATION BY WHALERS, SEALERS AND OTHERS.

Floe.....	A large mass of floating ice.
Pan.....	A small floe or small piece; one that can be forced aside or slewed.
A field.....	A large body of ice that may be seen around.
Land floe.....	Ice frozen fast to the shore.
Packed ice.....	Are small pieces closed together and held by the pressure of ice and currents.
Ice blink.....	Is a peculiar pale yellow reflection of the sky, indicating the presence of ice at a distance.
The ice pack.....	Is a large body of solid ice extending across the whole sea, and beyond which it is impossible to advance.
Slack ice.....	Is detached so that it can be worked through. Ice is said to be slacking when it begins to be open so as to be navigable.
Running abroad.....	Ice is said to be running abroad when it opens out or slacks away so as to be navigable.
A Nip.....	Ice is said to be nipping when it begins to close by reason of the action of the winds or currents, so as to prevent the passage of a vessel.
Calving.....	Ice is calving when the small pieces break off from the bottom and rise to surface of the water.
A lead.....	Is a strip of navigable water opening into the pack.
A blind or lead pocket.....	Is a short opening into the pack, and terminating against solid or thick ice.
Hummocky ice.....	Is rough, uneven or thick ice.
Porridge ice.....	Is small finely ground up ice.
Slob.....	Is snow afloat and forming into ice.
Sish.....	Is thin new ice just formed in thin sheets.
Lolly.....	Is loose new ice.
Waking.....	Is the following in the wake of another vessel through leads and slack ice.
Backing, running or butting.....	Is backing and running the ship at ice in order to force or head a way through it.
Slewing.....	Is forcing the vessel ahead against the corner of a piece of ice, with the intention of causing it to slew or swing out of the way, so as to force a passage by it.
Tracking.....	Is following along the edge of the ice pack.
Water sky.....	Is a dark and bluish appearance of the sky indicating open water beyond the pack.
Slatches.....	Are considerable pools of open water in the ice.
Swatch.....	Is a small pool of open water in the ice.
Swatching.....	Watching for seal around a swatch.
Wash.....	Is the sound of the sea breaking against the ice.
Rote.....	Newfoundland term for wash.
Rafting.....	Occurs when two pans meet with force, either by the action of the winds or currents--the edges are broken off and either rise on the top of or pass under the body of the pans.
Pressure ridge.....	Is the ridge or wall thrown up while the ice is rafted.
Growler.....	Is a more or less washed and grounded lump of ice which rolls about in the water formed from broken up bergs or detached pieces of heavy old arctic floe ice.
Decker.....	Rafter at a pressure ridge (Newfoundland).
Black sheet.....	Is thin dark looking ice with snow on it; usually found between pans of older ice. At night or at a distance looks like open water.
Collar ice.....	Is the margin of ice frozen fast to an island or shore, presenting an abrupt wall against which the floating ice rises and falls with the tide.
Beset.....	Inclosed on all sides by the ice.

COMMISSION.

C. FITZPATRICK,

23-7-06,

Deputy Governor General of Canada.

CANADA.

EDWARD THE SEVENTH, by the Grace of God, of the United Kingdom of Great Britain and Ireland, and of the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India.

TO CAPTAIN JOSEPH ELZEAR BERNIER, of the City of Ottawa, in the Province of Ontario, in our Dominion of Canada,

GREETING :

A. POWER,

Acting Deputy Minister of Justice, Canada.

KNOW YOU, that reposing trust and confidence in your loyalty, integrity and ability, we have constituted and appointed, and we do hereby constitute and appoint you, the said JOSEPH ELZEAR BERNIER, to be the officer in charge of the Canadian Government ship *Arctic*.

TO HAVE, HOLD, EXERCISE AND ENJOY the said office of officer in charge of the Canadian Government ship *Arctic* unto you the said JOSEPH ELZEAR BERNIER, with all and every the powers, rights, authority, privileges, profits, emoluments and advantages unto the said office of right and by law appertaining during our pleasure.

IN TESTIMONY WHEREOF, we have caused these our letters to be made patent and the Great Seal of Canada to be hereunto affixed. WITNESS, the Honourable Charles Fitzpatrick, Deputy of our Right Trusty and Right Well-beloved Cousin the Right Honourable Sir Albert Henry George, Earl Grey,

Viscount Howick, Baron Grey of Howick, in the County of Northumberland, in the Peerage of the United Kingdom, and a Baronet; Knight Grand Cross of our Most Distinguished Order of Saint Michael and Saint George, &c., &c., Governor General of Canada.

At our Government House, in our city of Ottawa, this Twenty-third day of July, in the year of our Lord One thousand nine hundred and six, and in the sixth year of our reign.

By command.

F. COLSON,
Acting Under Secretary of State.

C. FITZPATRICK.

23-7-06,

Deputy Governor General of Canada.

CANADA.

EDWARD THE SEVENTH, by the Grace of God, of the United Kingdom of Great Britain and Ireland, and of the British Dominions beyond the Seas, King, Defender of the Faith, Emperor of India.

To CAPTAIN JOSEPH ELZEAR BERNIER, of the City of Ottawa, in the Province of Ontario, in our Dominion of Canada.

GREETING:

A. POWER,
Acting Deputy Minister of Justice, Canada

KNOW YOU, that reposing trust and confidence in your loyalty, integrity and ability, we have constituted and appointed, and we do hereby constitute and appoint you, the said JOSEPH ELZEAR BERNIER, to be a fishery officer under the Fisheries Act and any Act in amendment thereof, and under the Act intituled 'An Act Respecting Fishing by Foreign Vessels.'

TO HAVE, HOLD, EXERCISE AND ENJOY the said office of a fishery officer, unto you, the said JOSEPH ELZEAR BERNIER, with all and every the powers, rights, authority, privileges, emoluments and advantage unto the said office of right and by law appertaining during pleasure, and with full power and authority to exercise the functions, powers and jurisdiction of a justice of the peace for the purposes of the said 'Acts' or any of them, and of any regulations made or continued thereunder or in respect thereto.

IN TESTIMONY WHEREOF, we have caused these our letters to be made patent, and the Great Seal of Canada to be hereunto affixed. WITNESS, the Honourable Charles Fitzpatrick, Deputy of our Right Trusty and Right Well-beloved Cousin the Right Honourable Sir Albert Henry George, Earl Grey, Viscount Howick, Baron Grey of Howick, in the County of Northumberland, in the Peerage of the United Kingdom, and a Baronet, Knight Grand Cross of our Most Distinguished Order of St. Michael and St. George, &c., &c., Governor General of Canada.

At our Government House, in our city of Ottawa, this Twenty-third day of July, in the year of our Lord One thousand nine hundred and six, and in the sixth year of our reign.

By command.

F. COLSON,
Acting Under Secretary of State.

REPORT OF THE CRUISE OF THE DOMINION
GOVERNMENT STEAMER *ARCTIC* IN
NORTHERN WATERS SURROUND-
ING ARCTIC LANDS AND
ARCTIC ARCHIPELAGO
IN 1908-1909.

CHAPTER I.

Departure from Quebec.

Under a Royal Commission, issued to me to annex lands and territories granted by the British Crown to Canada, and as fishery officer of the northern waters of Canada, I commanded the steamer *Arctic*, fitted out and made ready for sea for a two years' voyage under instructions of the Marine and Fisheries Department. Specific instructions were given as to the waters to be patrolled, explored, and lands to be annexed in continuation of the two voyages already made to the northern waters by the same ship, commanded by myself. Discretion was given in the instructions issued by the department, to use my best judgment in the matter of remaining in the regions referred to during the winter of 1909-10 or of returning to Quebec in the fall of 1909, as late as safety would permit.

The vessel was inspected by the Hon. Mr. Brodeur, Minister of Marine and Fisheries, and Rear-Admiral Kingsmill, commander of the steamers of the department, and found to be in a seaworthy condition, with all necessary stores for the perilous undertaking. An address was made at the time by the Minister to the officers and crew, acquainting us of the expectations of the Government and people of Canada respecting the result of the voyage, and wishing us a prosperous and successful cruise. Rear-Admiral Kingsmill also addressed the officers and men of the ship, expressing confidence in the *Arctic* and those who

were to voyage in her, at the same time joining in the kind wishes of the Minister. The addresses were replied to by myself on behalf of the officers and crew, and the opportunity taken to express our thanks to the gentlemen who addressed us, for their extremely kind wishes, at the same time, feeling sensible of our duty to our country. Advantage was taken of the opportunity to acknowledge the pains taken to equip the vessel for the trying voyage, and the study of our comfort when in Arctic waters, and to express the relief afforded by the assurance that allowances would be made our wives and families from our pay in our absence.

An interesting incident in connection with our departure from Quebec, was the presence of His Royal Highness the Prince of Wales, who, at the time, was attending the Tercentenary Celebration of the founding of Quebec. At 1.30 p.m. of the 28th of July, we steamed between the vessels of the British fleet and several French and American naval vessels, at anchor. The harbour was at the same time filled with vessels of all nationalities. We passed by the naval vessels, saluting them, and were greatly honoured by the cordial manner in which the salute was returned by all vessels within sight, as our little vessel passed down abreast of the harbour.

The most stirring circumstance to us personally, was the display of comradeship shown by the officers and crew of the British fleet. Strains of the music, from the magnificent band of H.M.S. *Indomitable* playing 'Auld Lang Syne,' reached our ears. We were thrilled by the kindly spirit suggested in the selection of the music by the men who were serving under the same flag which our little ship was starting out to again plant upon the heights of the far northern lands, and we spontaneously broke out into cheers, as the best expression of our feelings, at the time, towards those who kindly wished us bon voyage.

We had fine weather down the St. Lawrence, and everything went well. At 2.15 on July 30 we landed our mail and pilot at Father Point, and took on board mail and parcels for the officers and crew sent by friends. With fair wind and hazy weather, we continued our voyage under full sail and steam,

and entered the Gulf of St. Lawrence on the morning of the 1st of August. While passing through the Strait of Belle Isle, a very heavy gale prevailed, which kept us from landing at Chateau bay, where we intended to land to send our last mail. On August 4, we were through the strait and were sailing and steaming along the Labrador coast northward. Several icebergs were passed on the east side of Double island, from which place we saw the last light on our voyage northward. At this point we left the Labrador coast and shaped our course towards Greenland.

Sailing towards Coast of Greenland.

On August 4 and following days, we had variable weather up to the 10th; several drifting icebergs caused us to diverge from a direct course until we had successfully passed them. The officers and men at this stage received their heavy clothing, as we were approaching the Arctic circle. I may here remark that some of the men were poorly clothed when they came on board, and, to my astonishment, had not supplied themselves with suitable changes for a long voyage in extreme cold weather. These men were under the misapprehension that the vessel would find all the heavy clothing that was necessary. In future voyages, the precaution should be taken to inform all men when engaging them, that they must provide a good supply of warm clothing on their own account before leaving. This will prevent a recurrence of drawing so largely upon the stock on board, which is intended for emergencies and for use in case of loss and to replace worn out apparel.

On August 11, we passed over Hellebank in 23 fathoms of water. The current was running to the northeast. This bank is a large feeding ground for halibut, and the quantity taken at present is no doubt of considerable commercial value; besides the Danish, Scotch and American whalers who fish for their own use, American schooners visit the banks to fish for the market. The fisheries can, of course, be more extensively prosecuted, with advantage. The bank lies in about 64 degrees north latitude and extends northward for many miles. The distance from the entrance of Hudson strait is about 240 miles north or above the strait, and about 400 miles in a northeasterly

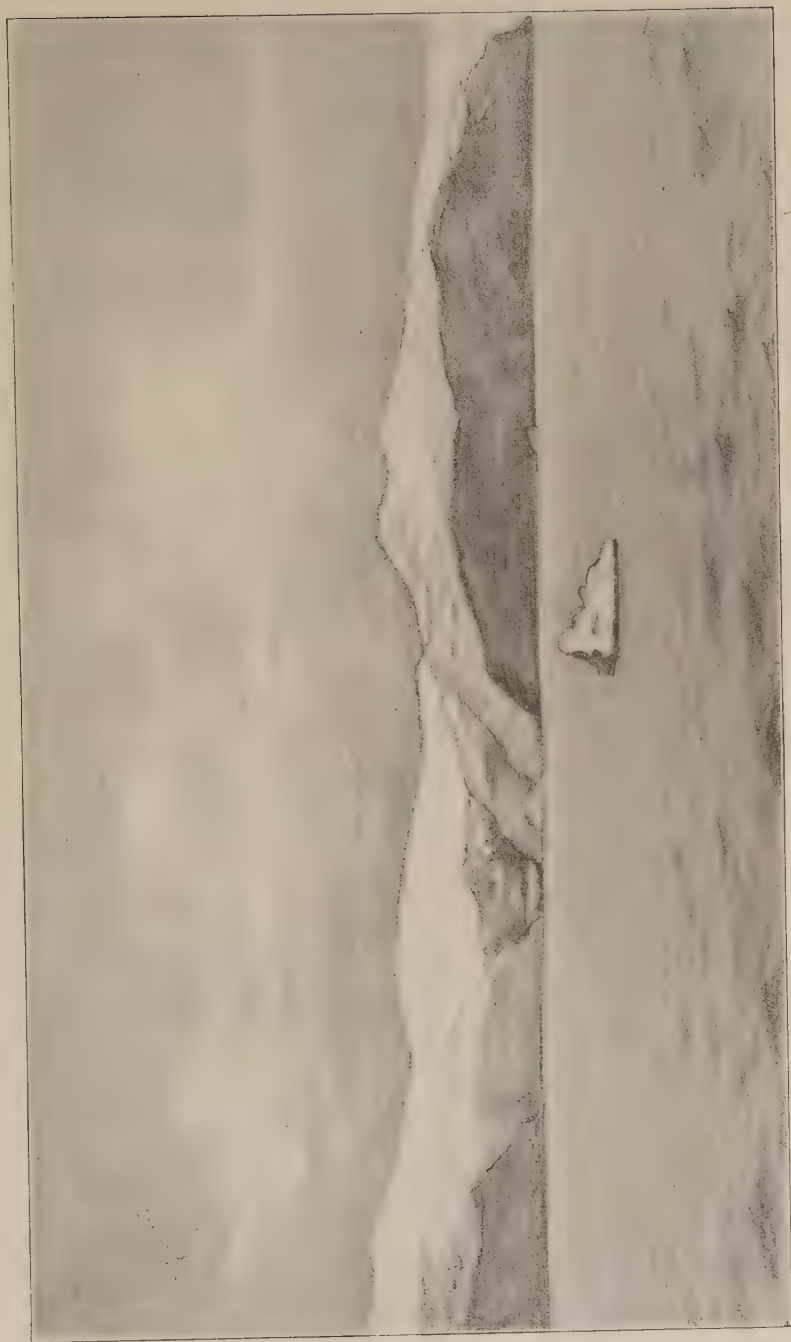
direction from the entrance. Our time was too limited either to fish for our own use, or to prove whether the halibut could be secured in large quantities, as we were pushing on to our destinations.

On the western edge of the bank, several icebergs were aground, indicating the shoaler water and to some extent the contour of the bank as it continues northward. Under these conditions soundings were unnecessary, for by the height of the bergs above water, we were able to judge approximately when we were in deep or shallow water. The mariner, after short experience, becomes expert in estimating the depth of water where icebergs ground. The different icebergs were leaning on all sides of the bank, and lurching with the force of the sea; occasionally one or other, by the effect of 'calving,' would change its position and by the loss of weight would move off into deeper water or float higher up on the bank, according to the direction of the wind and current. Outside these sentinels of the halibut bank was a large body of packed ice, carried by the currents, while on the inner side, there was generally open water. From the banks we approached the coast of Greenland, arriving off Sukkertoppen.

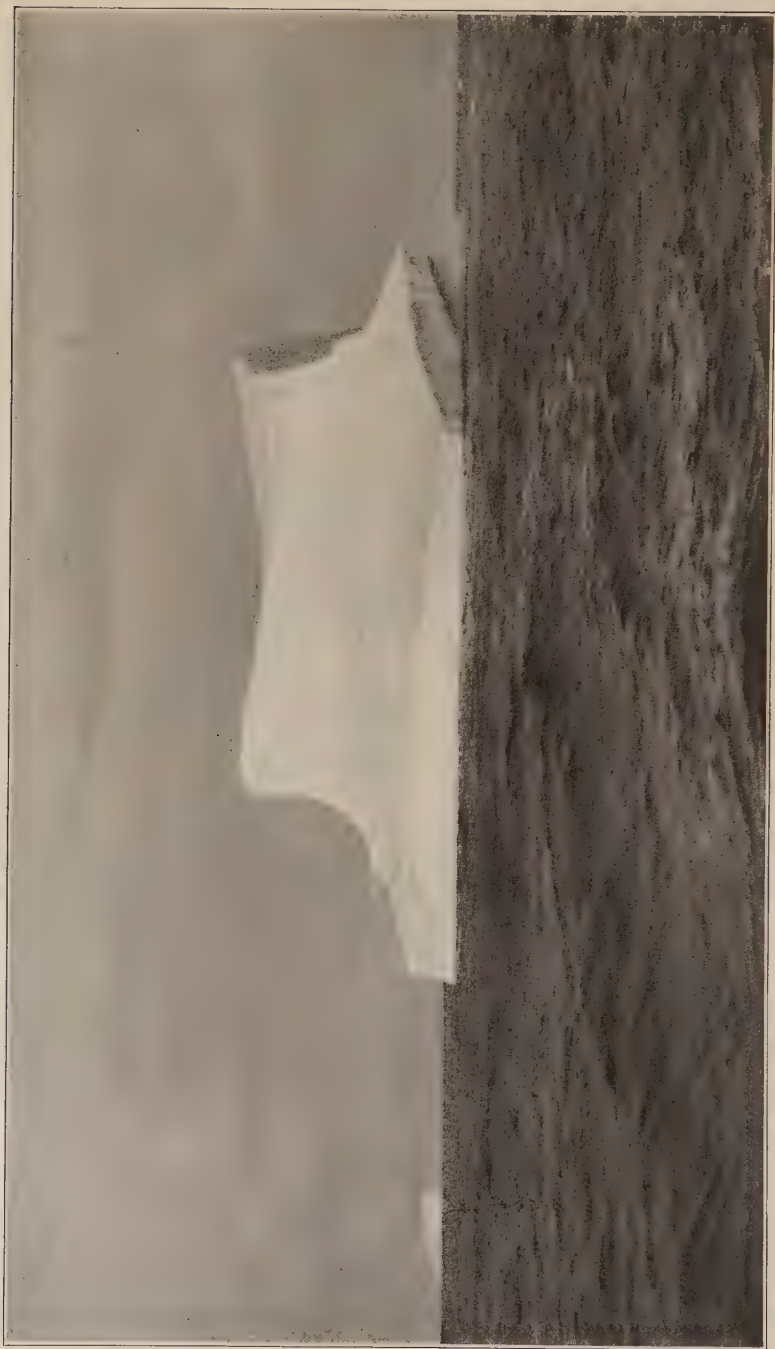
Coast of Greenland.

The coast of Greenland here presents varied descriptions of bays and other indentations which run inland a long distance, and containing deep water fiords that would give the best of shelter for any sized ship. The coast of this country presents changing views—at some points are high peaks, snow covered and ice capped, while at other places are seen glaciers which terminate at the sea line in all of these fiords.

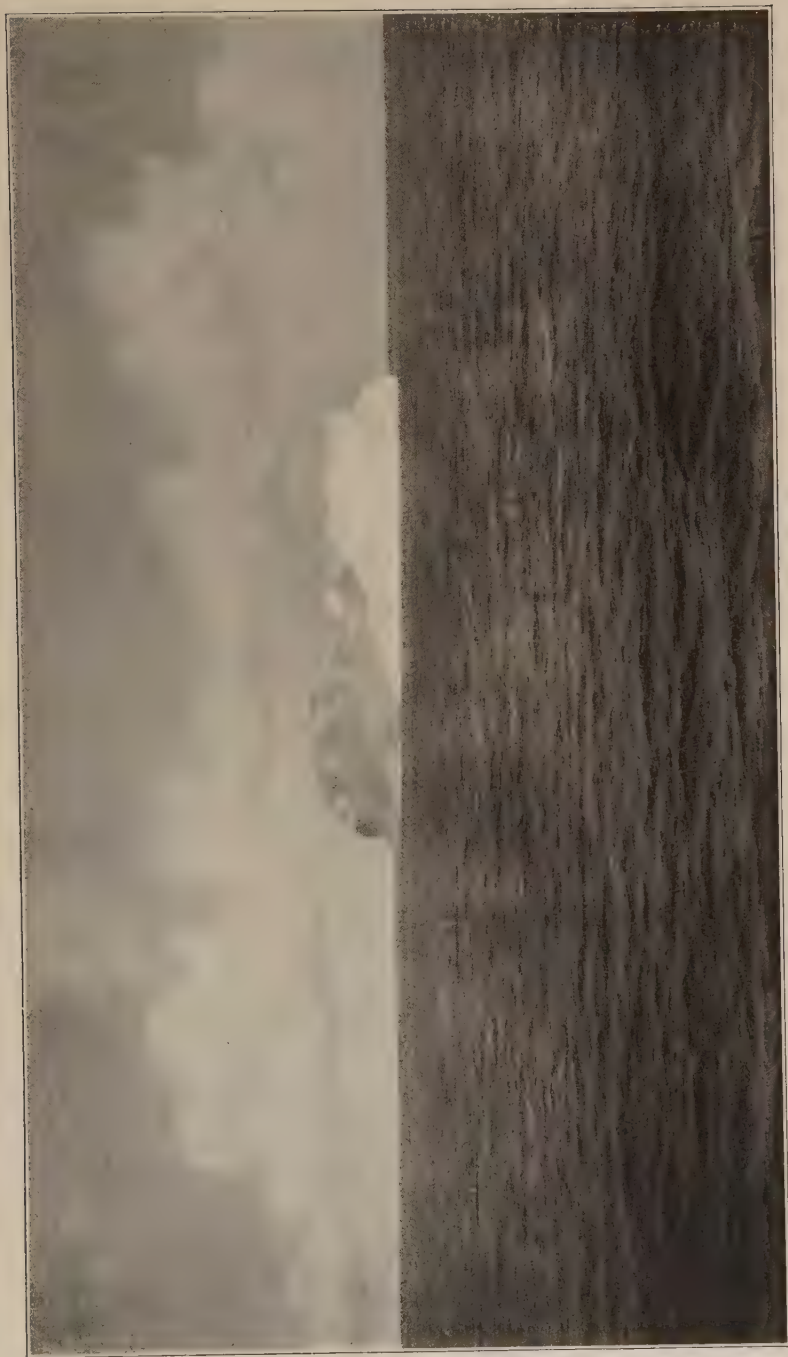
The natural outline of the land formation of the country cannot be conceived; it is clothed with snow and ice and the valleys filled with glaciers. These glaciers present in places, smooth surfaces and in other parts, deep gullies or crevasses, wrought by the action of the surface water in the summer season. The constant bodily movement downward of glaciers to the sea line where they break off and icebergs are formed, is estimated at 50 feet annually. Some of the headlands in this vicinity rise precipitously from the sea, others slope gradu-



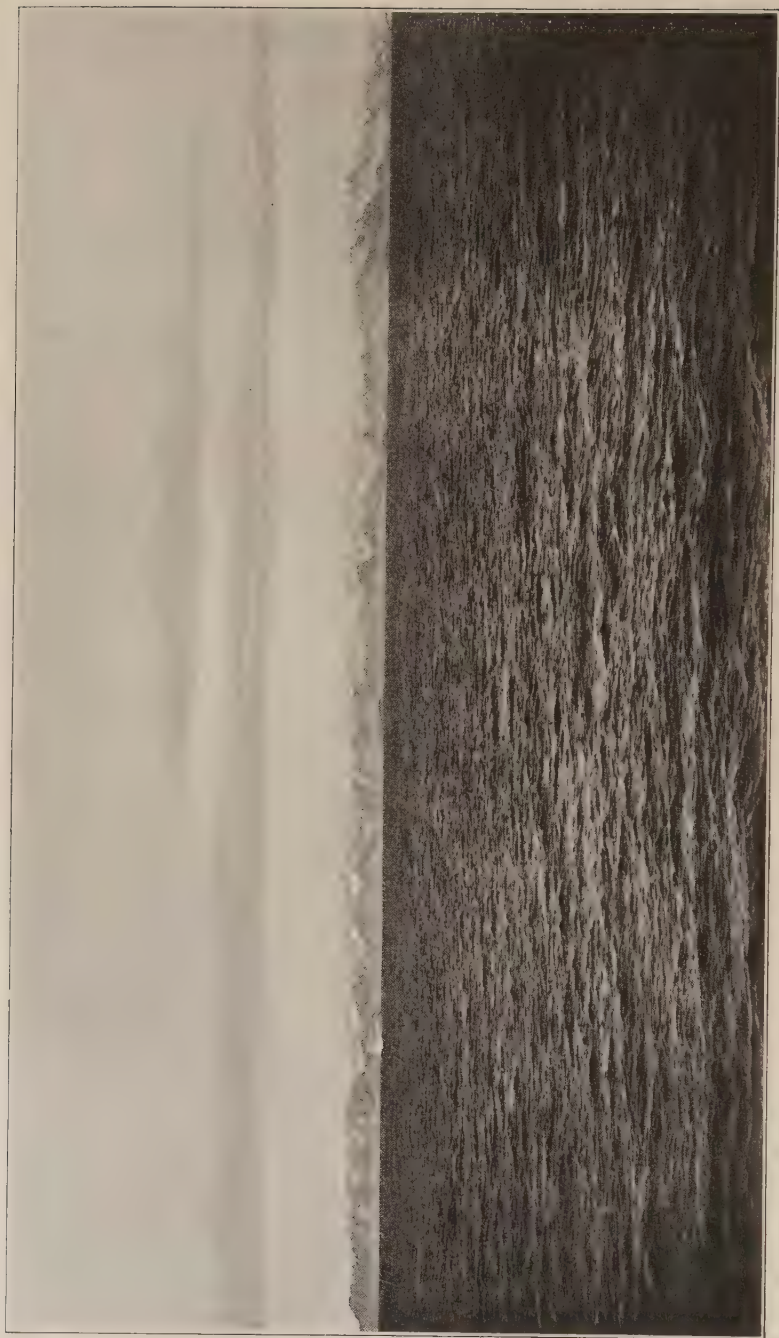
Disco Island, Southern Coast of Greenland.



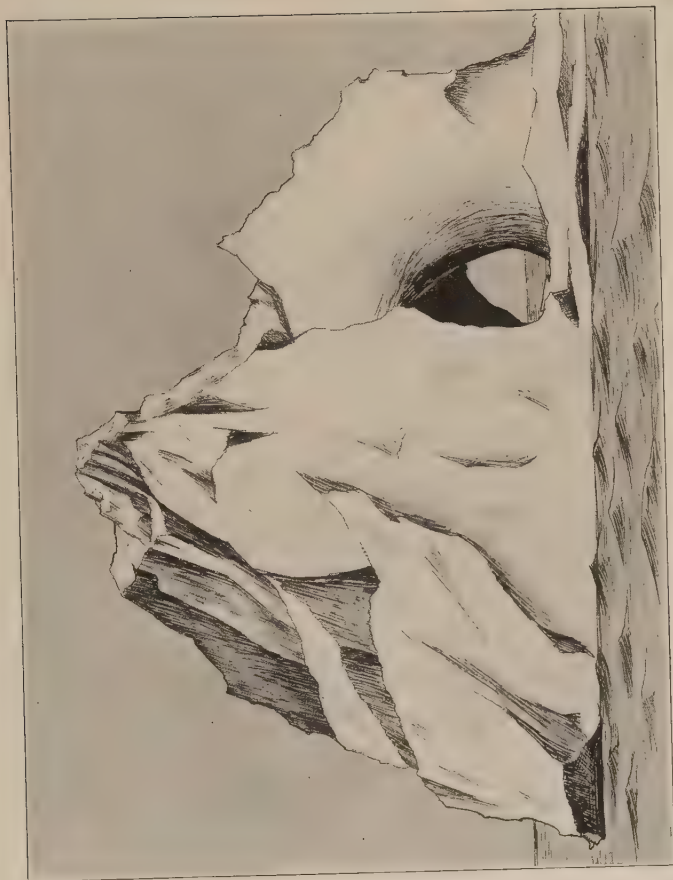
Iceberg on the Coast of Greenland.



Iceberg on the Coast of Greenland.



West Coast of Greenland.



Iceberg off Coast of Greenland 14th August, 1908.

ally; at the base are outlying islands which abound with millions of sea fowl. Rocky cliffs along the coast from Cape Farewell to Disko are worn into fantastic shapes, caverns and retreats, where the birds find protection for their nests and young. The perpendicular cliffs are formed of rock of different colours and hardness, and are rugged in appearance, at other points the coast line is comparatively smooth, caused by erosion and weather action.

On August 4, we passed the island of Disko, which lies in the neighbourhood of 70 degrees north latitude; here there are two excellent harbours and a deposit of good steam coal. During the night fog prevailed, but on the morning of the 15th, it cleared and we saw the high mountains beyond the shore line. Here we met a great number of icebergs of large dimensions, all following the coast line towards the south, at times in single lines, and at other times in several rows. On this day, having clear weather, we obtained a most beautiful view of the coast. The mountains reached a greater height and the scenery was on a more magnificent scale than on any part of the coast previously seen. The mountains, for a height of two thousand feet, exhibit nothing but bare rock, and for an additional height of three or four thousand feet are covered with snow and ice. The irregularity of the height and size, and the number receding back from the coast—mountains opposite the valleys—give variety and present a sea-like aspect and a grand tableau. In this latitude at this time (August 15) it is daylight during the 24 hours; this, of course, was to our advantage in pursuing our voyage.

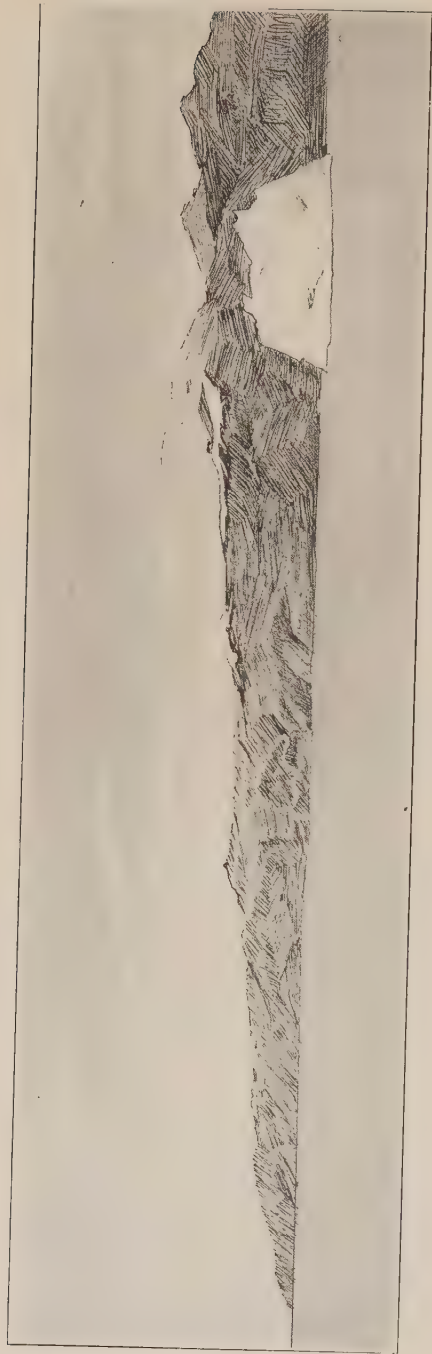
Generally speaking, the weather had been fine after leaving the Strait of Belle Isle, but at times hazy and at other times foggy, which made it necessary to keep a sharp lookout and exercise the utmost vigilance in navigating the vessel. In these northern waters, hazy and foggy weather compels the commanding officer to be constantly on deck as his vessel is passing around and by icebergs and growlers, which present extreme dangers, especially in heavy winds. The winds from the south, southwest and southeast bring fog, while the easterly winds bring rain, sleet and snow. We had the good fortune to

have passed Melville bay, one of the most dangerous localities on the coast on account of field and heavy ice, the bay also being studded with icebergs aground.

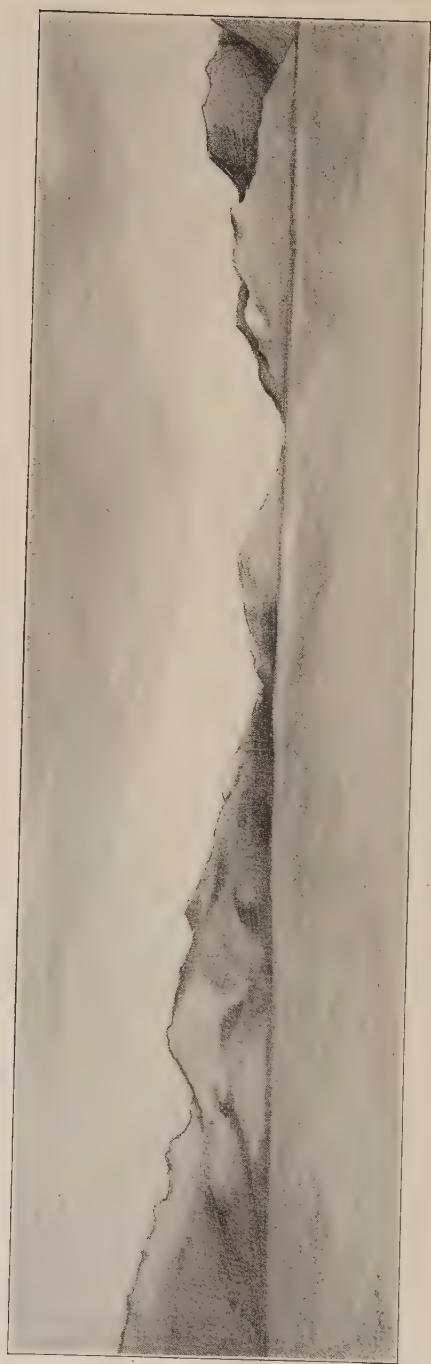
Melville bay has within its length, along the coast, a large number of glaciers which discharge into the sea, forming the icebergs. The bay is about 400 miles long from Uppernivick to Cape York and about 90 miles deep. I made a curve, the customary practice of navigators in the bay, on account of the middle pack ice which moves according to the wind. When the wind is west or southwest the ice jams; it is forced up on the glaciers, and if a vessel is caught she becomes frozen in by young ice. Whalers are sometimes a month in the pack in Melville bay. There are some clusters of islands along the coast which help to break the large fields of ice and open up leads for vessels. Experience teaches the ice navigator, that the safety of his ship depends upon preventing her from being beset. No leads should be entered, unless from the start a clear way out is seen. If the wind is on the land, care should be taken to find out how much water is between the ice and land. The most open navigation is along the land, as a general thing, but the usual coast dangers have to be contended with.

On the 17th we ran until 5 p.m., when the weather changed and the wind increased to a gale; we shortened sail, close reefed and hove to on the port tack, because of the thick sleet. When about 6 miles off Cape York, the gale moderated a little, and the weather clearing, we saw the cape, and from this point shaped our course for Smith sound, passing to the westward of Wolsenholme island. At Cape York, several families of Eskimo are living; no other Eskimo inhabit the country from Uppernivick to Cape York, nor do these people migrate south.

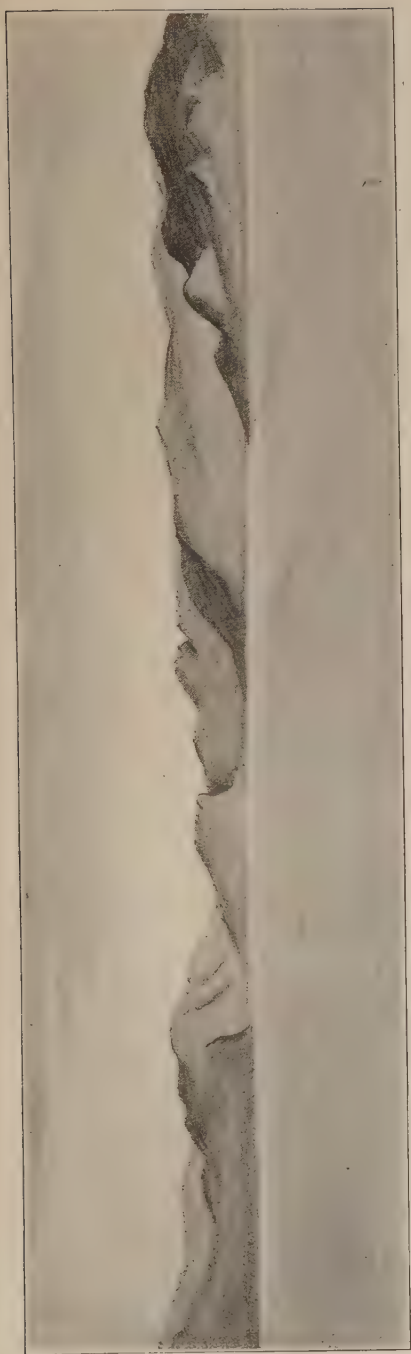
During the afternoon, we passed Petiwick glacier; this glacier is about ten miles wide. At 10 p.m., we passed Cape Parry, a very bold cape, appropriately named after the intrepid explorer, Captain Parry. At midnight, we sailed by the most western part of Northumberland island; the wind was from the southward with heavy rain, and we passed Hakluyt island, the *Arctic* running at a speed of ten miles an hour, under sail and steam, but at 8 a.m. we hove to on account of sleet, and



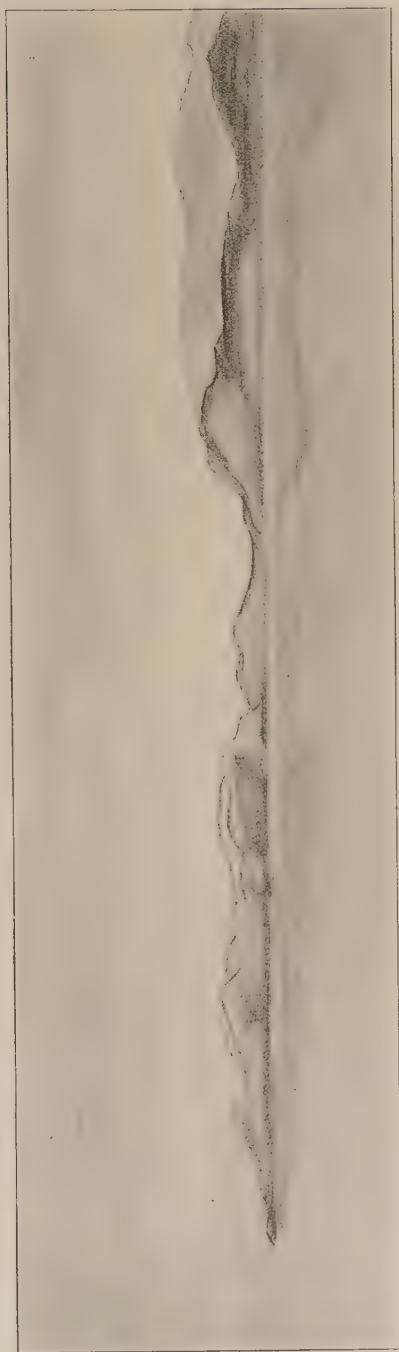
Lowernivik, Greenland.



Upernivik, Greenland.



Upernivik, Greenland.



Upernivik, Greenland.



Hare Island, off coast of Greenland.

fortunately for us this was done, for at 4 o'clock we sighted loose ice which we would have run into, possibly causing injury to our vessel. We were able to follow along the edge of the ice until we sighted Cape Alexander, on this part of the coast of Greenland.

Arrival at Etah, Greenland.

At 5.30 p.m. on August 19, we dropped anchor in Etah harbour, and found the ship *Erik*, under the command of Captain Samuel Bartlett; the ship *Roosevelt*, of the Peary expedition, had left the day previous. We landed stores at Etah during the night for Dr. Cook and delivered them to Mr. Harry Whitney, sending the receipt of the delivery to Mrs. Cook, in the United States, by the *Erik*. Several boat loads of fresh water were taken on board to fill up our tanks; the crew working in watches while landing the stores and filling the boilers of the *Arctic*. The water was taken from a running brook; the land at the place was bare of ice and snow and showing some vegetation interspersed with wild flowers. The vegetation affords sustenance to deer, musk oxen and hares. At this place were seen millions of little auk flying in flocks and evidently migrating towards the south. The officers and crew had an opportunity to prepare and send letters by the *Erik*; Captain Bartlett and myself exchanged visits to each ship. The captain promised to telegraph our progress on his return to Indian harbour or Battle harbour. Etah being Commander Peary's headquarters, there were considerable quantities of stores and coal on the shore, and here, too, were met a few aged Eskimo in charge of the Eskimo women. An effort was made to procure two teams of dogs, but the men in charge of Commander Peary's stores would not sell the dogs on any account. In the harbour of Etah, especially in the eastern part, a vessel in an emergency could be beached and repairs made to her bottom or propeller at low water. Very few places offer the same advantages in the northern waters along the coast of Greenland.

Leaving Etah for Lancaster Sound.

On the 20th, at 8 o'clock a.m., our last boat of fresh water came off, we delivered our mail on board the *Erik*, got underway

and were outside the harbour at 9 o'clock. Several icebergs were aground at the entrance. The entrance of the harbour of Etah is very good for any class of ship, with good water everywhere; the only danger is a rock awash at the mouth, and if a beacon were provided to clear the rock, it would be safe. We shaped our course to pass to the westward of Northumberland island. This island is very high and rugged, in fact being higher than any other of the islands in the northern waters, with several deep indentations which make it appear at a distance like several islands; it is snow capped all the year round. Whalers enter Whale sound to the southeast and Inglefield gulf, to hunt walrus, where they are found in great numbers. From on board the *Arctic* we saw several lying on field ice sunning themselves, but not having time at that late season for shooting, none were shot by us. Unless these animals are killed instantly they are dangerous to attack from a boat. Bullets have little immediate effect upon them unless they are shot behind the ear, or in the back of the neck. The skin is very thick and the wound closes immediately, if hit in the body; eventually these wounds cause death and the animals sink. The skin is used in commerce for making belting and is valuable.

The crew and Eskimo engaged by Commander Peary have killed a great many, estimated at two hundred per annum, for their skins and ivory. The Eskimo method of killing the walrus is by harpoon with a seal skin filled with air attached. When the animal dives, it is impossible to carry this air bag under water, and eventually it is drowned and the bag serves to prevent it from sinking. Here, I might also mention that the American expeditions have been accustomed to kill and use large numbers of musk oxen on Ellsmere land, estimated within the last twenty-seven years to be about 800, which has had a tendency to decrease their numbers very rapidly.

Killing Animals in Ellsmere Land.

The Greenland Eskimo, who were engaged by Commander Peary in large numbers, killed an additional number of musk oxen, deer and hares to maintain themselves, the skins of which were secured by the Peary expedition. Ellsmere Land, would at this time be practically a virgin country for game, if the

extensive hunting referred to had not been persevered in. The British explorers were not known to go far inland on hunting expeditions. The Norwegian expedition under Captain Sverdrup, killed also, over two hundred musk oxen on Ellsmere Land and on the two large islands to the westward. Dr. Cook also killed about one hundred, but the two latter expeditions hunted merely for the purpose of providing food for themselves and their dogs, in their attempts to reach the north pole. I am of the opinion that Canada will not object to hunting, for food purposes, by explorers who prosecute their explorations in the interest of science, but regulations enforcing a judicious course should be adopted, to prevent numbers of Eskimo natives of foreign countries exploiting Canadian territory, and destroying valuable hunting and fishing grounds. Even in this far northern land, close seasons should be established for the benefit of the Eskimo of our own land and British fishermen.

Summary of Voyages of Discovery and Polar Expeditions.

A summary of the voyages of discovery and polar expeditions to the Arctic sea by ship reached through Davis strait, Baffin bay and Smith sound is here given. The historical record appears in a number of reports and Admiralty papers, from which I have partly drawn the information. As the Canadian cruiser *Arctic* was now navigating part of Smith sound, the interest which is attached to these waters did not fail to attract the attention of all on board. The summary is bare of the intensely interesting incidents recorded in original reports, and merely serves to show that within four centuries the number of vessels which successfully passed through Smith sound can be counted on the fingers.

Martin Frobisher, in 1576-7, in three small vessels, two of them of 25 tons and one of 10 tons, was the pioneer in the navigation of northern waters between Greenland and Baffin land. He discovered what is now named Frobisher bay, and sailed up the bay to a point in latitude $63^{\circ} 45'$ north and longitude 68° west. He abandoned voyages of discovery and engaged in the commercial enterprise of conveying earth supposed to contain gold, to England.

John Davis, in 1585-6-7, in voyages of discovery led the way towards Baffin bay and Smith sound, navigating as far north as $72^{\circ} 15'$. Captain George Weymouth, in 1602, in the *Discovery* reached the 69th parallel of north latitude, but his crew mutined and he returned to England. Following him, Captain John Knight sailed in the *Hopewell* in the year 1606. His death brought the voyage to a speedy conclusion, and some of his men were killed by Eskimo.

The eventful voyage of Henry Hudson to Hudson bay, also in the *Discovery* took place in 1610. Thomas Button, Bylot and Prickett followed in 1612, but entered Hudson strait and navigated Hudson bay.

James Hall and William Baffin, in 1612, sailed to the west coast of Greenland, but it was not until 1616 that Baffin made his famous voyage to latitude $77^{\circ} 45'$, eclipsing all previous efforts in a northerly direction, in those waters. He discovered Baffin bay, named Smith sound to the north of it, and saw a prominent headland now called Cape Alexander. On his return south he discovered Jones sound and Lancaster sound, but did not proceed beyond the entrance of each sound. This brought to a close a brilliant voyage of discovery, and for about two centuries no further attempts were made to reach Smith sound.

Sir John Ross, in 1818, made his voyage of exploration by sea to the northern part of Baffin bay, but made the mistake of supposing that Smith sound was a closed bay.

Captain Inglefield, in 1852, penetrated farther north than any of his predecessors, in a small vessel called the *Isabel*, partially propelled by steam; he reached latitude $78^{\circ} 20'$ north, and built a cairn at Cape Isabella on Ellesmere land. From that point he could see the waters now called Kane basin, but did not pass through Smith sound. The above expeditions were termed discovery expeditions. The next to navigate Smith sound was Dr. Elisha Kane, who in a polar expedition, passed through the sound in 1853 into the basin, and wintered at Ranslear harbour, in latitude $78^{\circ} 25'$, but his vessel was left in the harbour. Dr. I. I. Hayes, in the year 1860, in an attempt to reach the polar sea navigated as far as Etah.

Chas. F. Hall, on a polar expedition in the year 1871, in the *Polaris*, which was navigated through Smith sound, Kane basin, Kennedy channel, Hall basin and Robeson channel, entered the Arctic ocean, proceeding to latitude $82^{\circ} 16'$ north.

Sir George Nares with two vessels, the *Alert*, under his own command, and the *Discovery*, commanded by Captain Stephenson, in a combined exploration and polar expedition, successfully navigated all the waters north from Baffin bay and Smith sound to the polar sea. He reached $82^{\circ} 25'$, the highest latitude made up to that time by ship. The noteworthy action of Sir George Nares in establishing a series of caches for future voyagers, was instrumental in saving the lives of a number of Greeley's party, several years later.

Lieutenant A. W. Greeley for the purpose of establishing a meteorological station, in 1881, steamed from St. Johns, Newfoundland, in the *Proteus*, with Captain Richard Pike, navigator, and after a comparatively easy voyage passed through Smith sound, Kane basin, Kennedy channel, and anchored in Discovery bay within Lady Franklin bay. The *Proteus* the year following was nipped and sank, but the station was established and observations taken. The Newfoundland steamer *Neptune* was sent out with supplies, but could not penetrate Smith sound owing to heavy ice. The disastrous end of this expedition is remembered by many now living. The party started south in a steam launch and two boats. They depended largely on the way south upon provisions left in caches by Sir George Nares; only seven men out of twenty-six survived the privations of this voyage.

Lieutenant R. E. Peary spent the years 1886-1891-2, 1893-5 and 1898-1902 in the regions around Smith sound; not one vessel engaged to carry him supplies, passed farther north than the southern part of Smith sound, and he was compelled to haul his supplies with sleds to the polar sea.

Captain Sverdrup, in 1898, in the *Fram*, attempted to pass through Smith sound to explore northern Greenland, but his way was barred by ice and he remained at Cape Sabine; in 1899 he returned south to Jones sound. Four winters were spent by him exploring, by means of sleds, the islands and

coasts west and north of Jones sound to latitude $79^{\circ} 50'$ north and longitude 107° west.

The expedition under command of A. P. Low, in 1903-4, was sent out in the *Neptune*, a vessel well known in connection with Arctic explorations. The *Neptune* entered Smith sound and reached Cape Sabine on an island separated from the mainland of Ellesmere land, by a narrow strait. Mr. Low landed at Cape Herschel on Ellesmere land, and took possession in the name of King Edward VII for Canada, at the same time he deposited a document in a cairn built of rock.

In 1906, Lieutenant Peary proceeded north again in the steamer *Roosevelt*, which was navigated by Captain Robert Bartlet of St. Johns, Newfoundland, and reached the latitude attained by Sir George Nares in the *Alert* in 1875-6.

In 1908, Lieutenant Peary in the *Roosevelt*, navigated by Captain Robert Bartlet, again passed through Smith sound and attained the same latitude as was reached by him in 1906.

By the use of sleds to convey supplies and instruments, the intrepid and enthusiastic explorers went still further north than their ships had reached. Valuable geographical knowledge has been the result; the extreme northern parts of Greenland and Ellesmere land have been determined. The success in some cases and disaster in other cases form a very important chapter in the history of Arctic explorations. The dogged determination of these explorers, the privation and hardships endured by them, place them in a rank second only to the early pioneers.

In 1853, Dr. Elisha Kane proceeded north from his vessel and reached the great Humboldt glacier, and William Morton, of the same expedition, passed the glacier to latitude $80^{\circ} 35'$ north, in Kennedy channel. Dr. I. I. Hayes, of the same party, crossed Kane basin to Cape Fraser, in latitude $79^{\circ} 45'$. The thrilling account of the sled trip by Lieutenants Markham and Parr and their men, members of Sir George Nares' expedition, in 1875-6, affords evidence of great endurance under great hardships. They reached $83^{\circ} 20' 26''$, the highest latitude north attained by this route up to that time; in the polar sea. The return journey to the *Alert*, which wintered in the polar sea in latitude $82^{\circ} 25'$, was accompanied by hardship and

suffering of the most trying nature. Lieutenant Parr managed to get to the *Alert*, and with a relief party under Sir George Nares, returned to Lieutenant Markham, who with several of his men were heroically struggling in an attempt to drag four of their companions on a sled back to the *Alert*. Lieutenant Beaumont of the *Discovery*, also under Sir George Nares, made a trip along the northeast coast of Greenland, and with one man reached latitude $82^{\circ} 20'$ north and longitude $50^{\circ} 45'$ west. The return journey to his ship deserves special reference owing to the trials which he experienced in consequence of scurvy amongst his men; Beaumont and one man only being free from the weakening disease. Lieutenant Aldrich, another of Sir George Nares' party, made a wonderful journey around the northern coast of Ellesmere land, surveying 220 miles of the coast, and would have gone farther if his men had not been stricken with scurvy. He reached $82^{\circ} 16'$ north latitude and $85^{\circ} 33'$ west longitude.

Lieutenants Lockwood and Brainard, of the Greeley expedition, left the Meteorological station in 1882, at Fort Congor, and passed the point on the northeast coast of Greenland reached by Beaumont, attaining the highest point of any explorers up to that period, the latitude being $83^{\circ} 24'$.

Lieutenant Peary spent many years in this section making superhuman efforts to reach the north pole, and in 1906 got as far north as $87^{\circ} 06'$ by a sledge expedition, and made another trip in 1908 still farther north.

In 1907-8-9, Dr. Frederick A. Cook, in the yacht *Bradley*, landed at Annootok, and with a companion sledged from Flagler bay across Ellesmere land into Bay fiord, Eureka sound, and then up Nansen strait northward, along Crokers land and Bradley land, photographs of which I have in my possession, obtained from the New York *Herald*. Cook returned to Etah and made one of the most arduous and difficult trips recorded from Etah to Uppernivick in Greenland, a distance of 800 miles.

It might be asked what was to be gained by the immense expenditure of energy and endurance of the hardships. Some of the results were an increased knowledge of the geography of

Arctic regions, the establishing of the fact that the polar sea was not an open one as had been supposed by many, and that immense quantities of heavy Arctic ice drift south into Baffin bay, and that the regions north of Smith sound are perpetually covered with snow and ice.

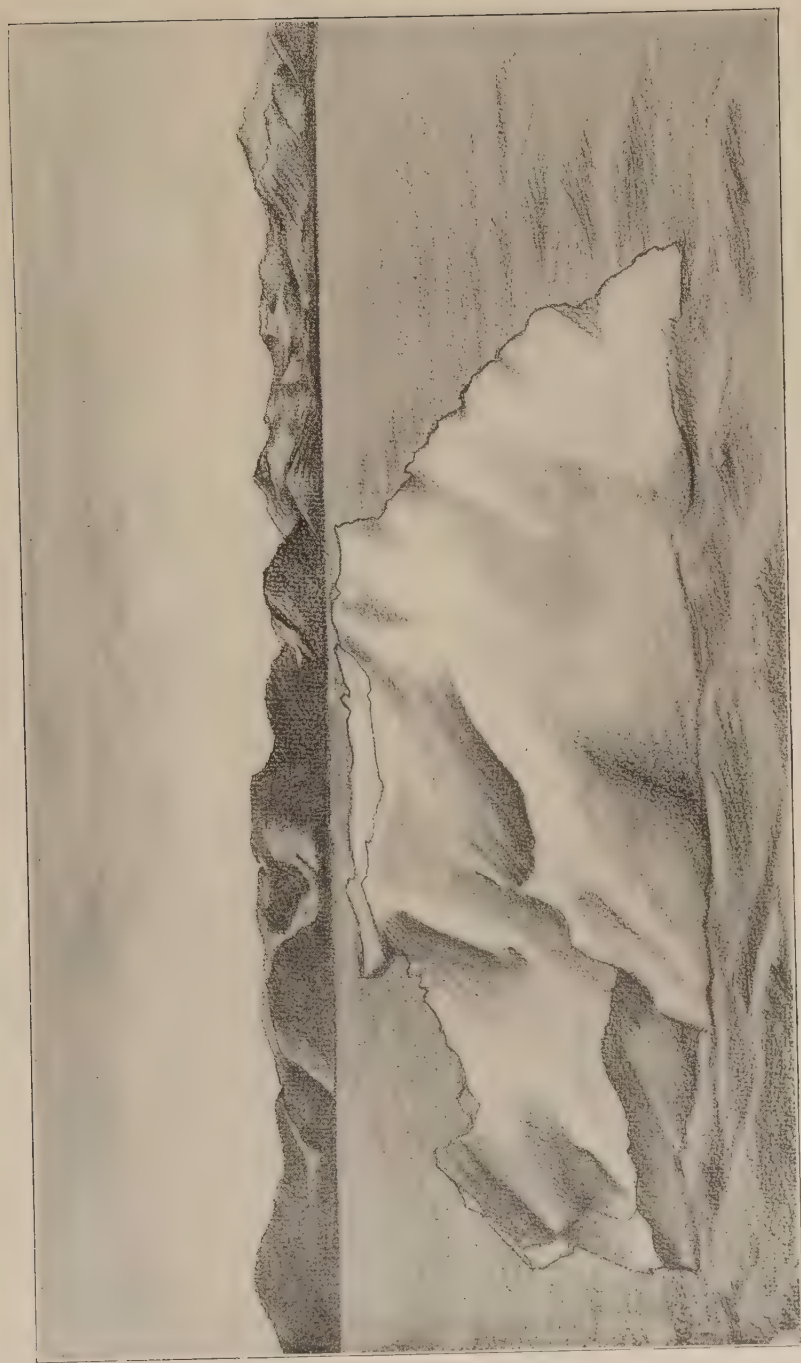
Crossing Baffin Bay.

To resume the recital of our voyage, I may here state that we passed on August 21, several large icebergs, but during the first part of the day, we encountered ice fields with large leads of water running west-northwest, and our course was shaped accordingly. During this whole day we passed an unusual number of large icebergs, of different sizes and shapes, going to the southward, parallel to the coast, at the rate of 10 to 12 miles a day, and these icebergs cut their way through the ice fields, which they break up, causing leads, so that ships may either follow in the wake of the icebergs or go in the opposite direction.

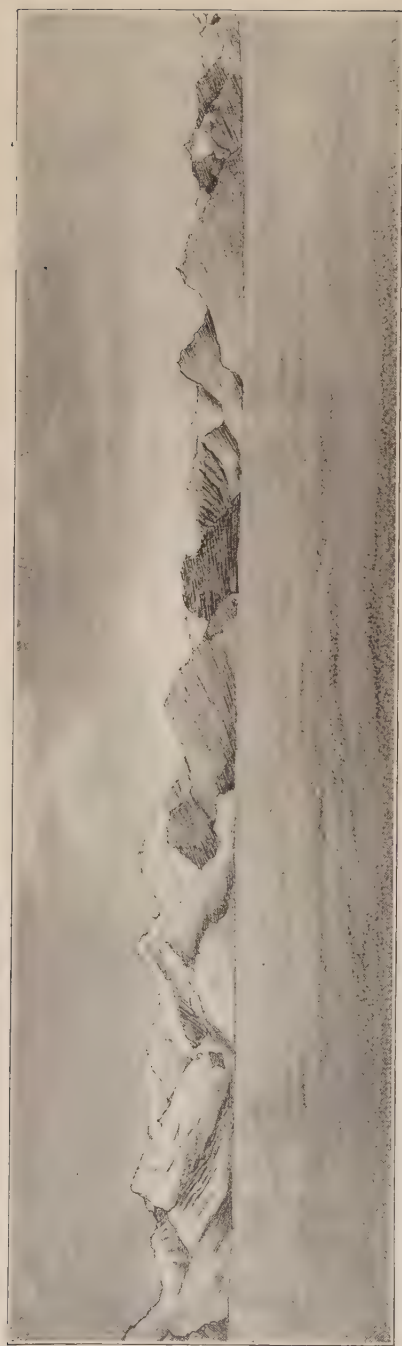
During the afternoon we sighted Coburg island, at the entrance of Jones sound, having sailed a distance of about 170 miles. The island was annexed by our expedition two years ago, at Edwards point, named after Senator Edwards who has always taken an interest in our expeditions. Having a strong fair wind on August 22, the *Arctic* broke her record of 10 miles an hour by making the greatest speed in any of our voyages. At noon of that day we were in latitude $74^{\circ} 45'$ north and $78^{\circ} 45'$ west longitude. At 3 p.m. we passed Hope monument, which is a shaft peak, shaped like a sugar loaf, and a splendid mark for strange vessels. Here we encountered a large quantity of small, rotten ice, in the midst of which, were large icebergs entering Lancaster sound, into which they drift for a certain distance, until they meet the western tide which drives them out of the sound.

Entering Lancaster Sound.

On the morning of the 23rd, the sun rose clear from the horizon, gilding North Devon and presenting a fine sight. The whole of the land is a high plateau with ravines where glaciers once formed and discharged into the sea, and this is shown by



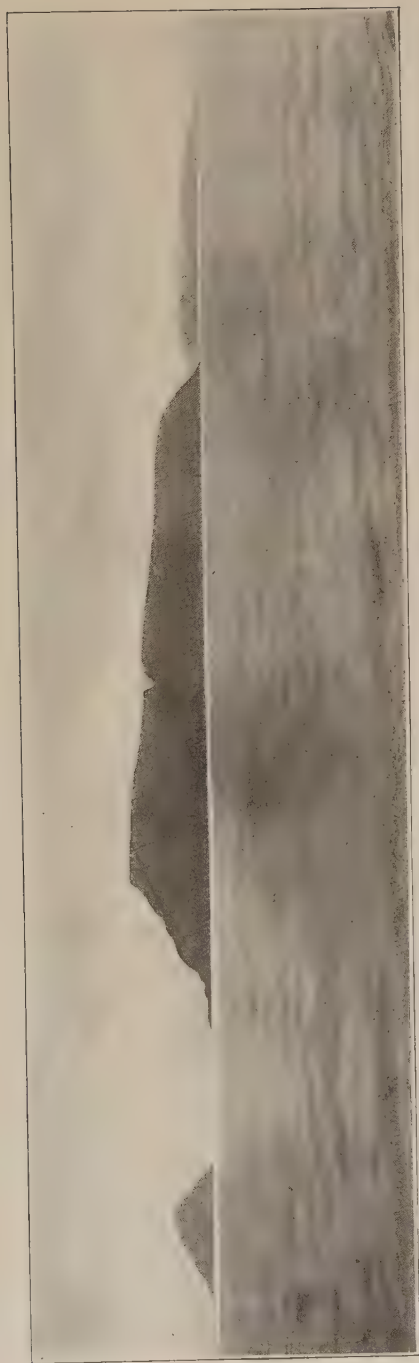
Entering Jones Sound from the North.



Eastern Entrance Jones Sound.



Icebergs in Jones Sound.



Cone and Smith Islands. King Edward Island to the right.



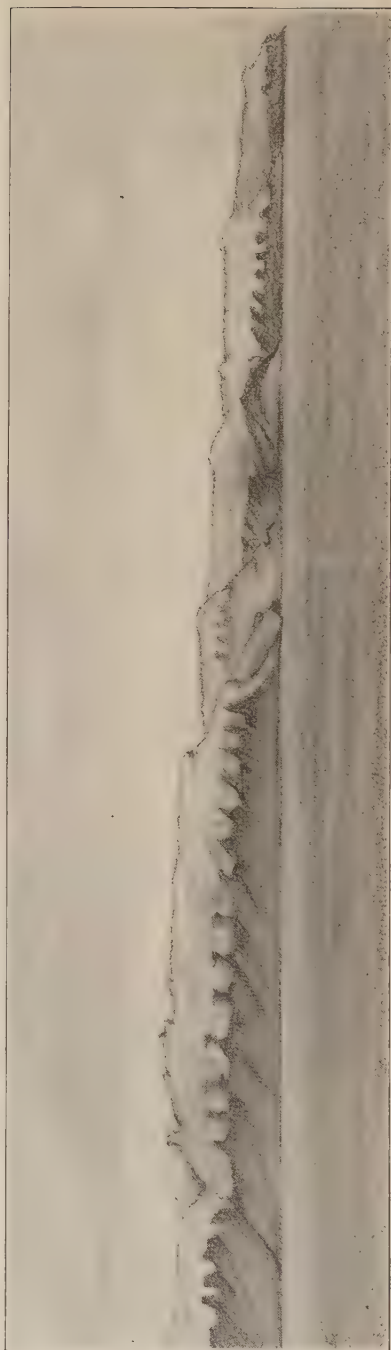
Entering Lancaster Sound—Coast of North Devon.



Iceberg in Lancaster Sound, near North Devon.



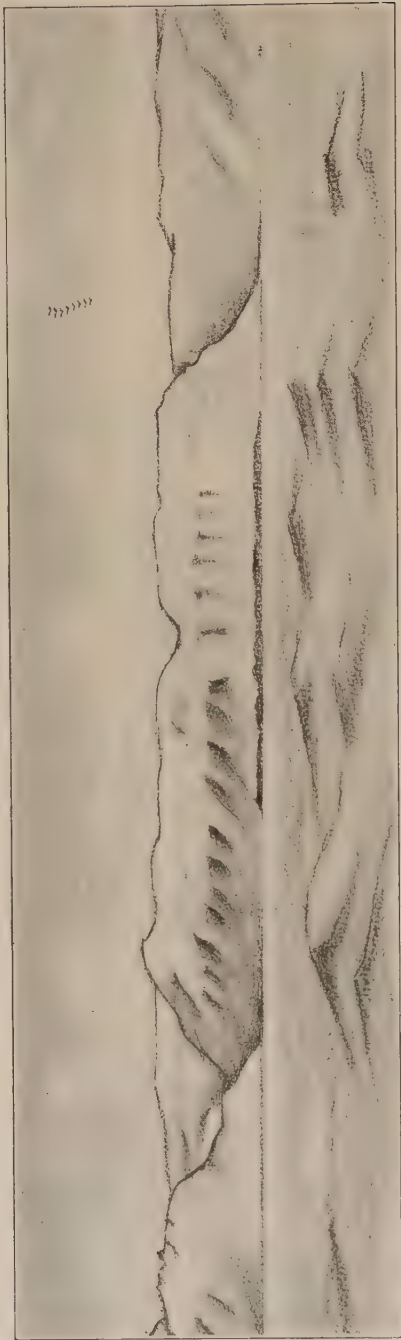
Flat Iceberg off Cape Sherard Osborn.



Coast of North Devon, Lancaster Sound.



Coast of North Devon, Lancaster Sound.



North Devon, Lancaster Sound.



Cape Sherard-Osborn, Lancaster Sound.

the glacial action on the banks. Glaciers once moved downward and formed bays, where harbours now exist of from two to three miles in length. The banks show from the ship several layers of different kinds of rock; some layers are harder than others, and overhang the softer rock, and being unsupported at the extreme outer edge have the appearance of being ready to fall. The softer layers of rock have eroded and precipitated large masses; these masses form the shores.

Arrival at Erebus Bay.

All of the 23rd, we sailed along the land to Erebus bay, where it was our intention to establish a depot for our own use in case of necessity. On the morning of August 24, we dropped anchor in 13 fathoms of water abreast of Sir John Franklin's memorial tablet, which was re-erected by our expedition of 1906. At 10 a.m., we landed four boat loads of provisions, built shelter over them, and left a record in case of accident to our ship, as we intended to continue further west. We remained in Erebus bay, making magnetic observations and securing geological specimens until 4 p.m., when we hove anchor and proceeded towards Griffith island. This island was named by Parry after Rear Admiral Edward Griffith. After the sun set, we met pack ice 24 miles west of Erebus bay.

Cornwallis Island.

The sun had been setting below the horizon for several days, but not sufficiently far to cause darkness. We made fast to the pack ice in a dense frozen fog. At noon on the 25th, the wind changed to the north and drove the ice out into Lancaster sound, enabling us to sail along the coast to Cornwallis island, named by Parry after Admiral Sir William Cornwallis. The island is of lower elevation than the other islands we had passed, containing low, rounded hills. Not many bays or harbours are to be found along its coast. On the 25th, we managed to find a passage between the land and the ice; during the evening we passed Baker island, off Bathurst island.

Bathurst Island.

Baker island, a small island off Bathurst island, was covered with snow, assuming the shape and appearance of a long white bird. Bathurst island was named by Parry after Earl of Bathurst. Strangers should be on their guard against being deceived by the sudden change of a dark island or land. The instant change of Baker island was caused by a snowfall a short time previously which covered the land entirely to the water's edge. Moores island was also passed, but was only recognized by a narrow band at the water line, due to the falling of the tide.

After sailing for an hour and a half, we sighted what we considered a piece of ice and steered for it as a mark on our course, but to my surprise, I saw a tide ripple, and having looked at it through the glass imagined the ice was aground. We stopped our ship, sounded, and found only 5 fathoms, gradually increasing to 6, 7, 9, 12 and 16 fathoms. This shoal is due west of Moore's island in latitude $74^{\circ} 57'$ north and $99^{\circ} 25'$ west longitude, bearing southwest from Ackland bay. Along this coast the water is very shallow, but the soundings are regular except the bad rocky patch described, which should be given a berth, especially by deep-draught vessels. The shoal is either an upheaval or an island worn away by the ice. On the morning of the 26th, we passed Cape Cockburn, about one mile off, and saw with the glasses the spot where we had left our record in 1906, apparently untouched. The weather was dull with light snow falling. At noon we were in latitude $75^{\circ} 8'$ north and longitude $103^{\circ} 15'$ west. No ice in sight.

Byam Martin Island.

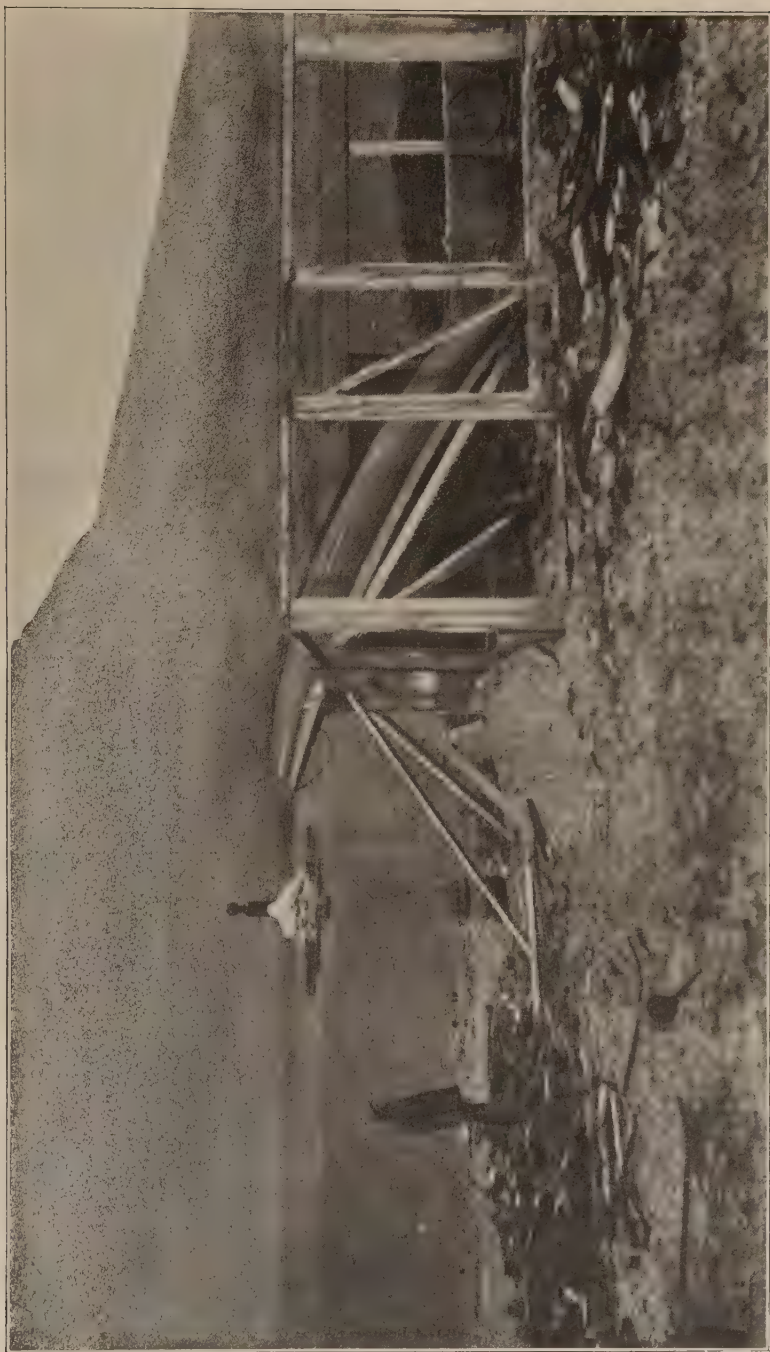
Byam Martin island was all covered with snow. Passing close to its south end we saw, on the shore by aid of the glasses, several musk oxen. The island is a beautiful level one, abounding with musk oxen and deer and where no hunting had been done. This island was named by Parry after Sir Thos. Byam Martin.



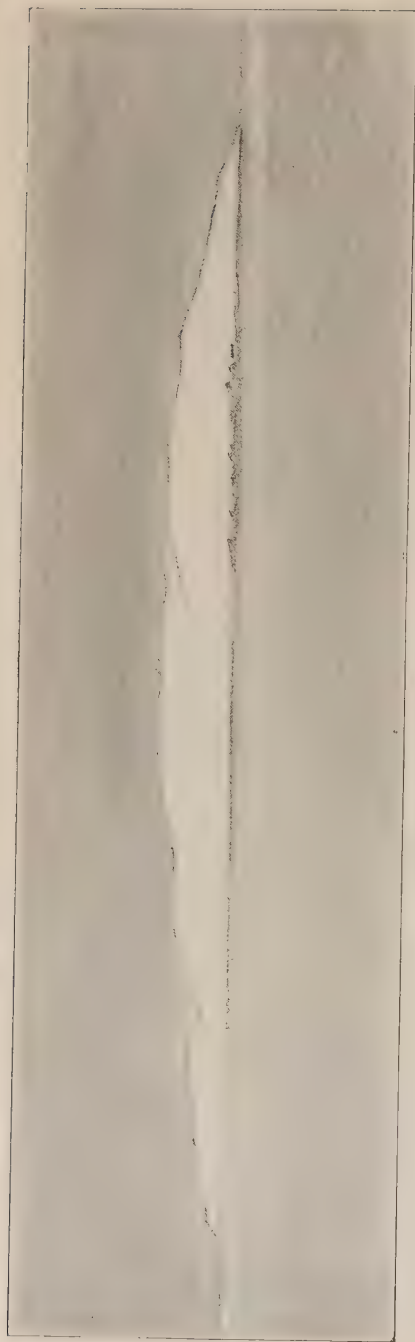
H. M. S. "Griper," Burnet Inlet, North Devon, 1819. Parry Expedition in search of the Northwest Passage.



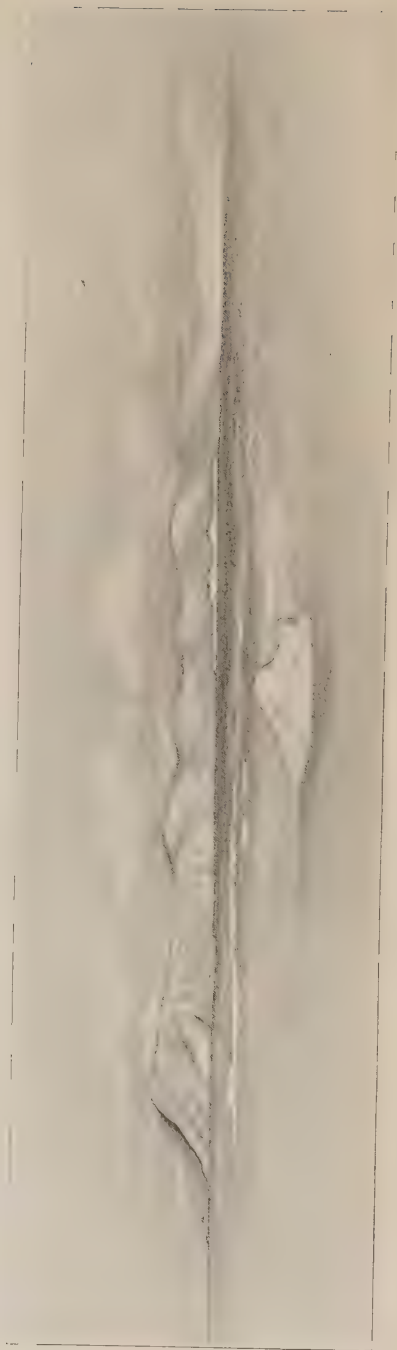
Headstones of four of Sir John Franklin's men, Erebus Bay.



Depot in Erebus Harbour, Franklin's Memorial in the background.



Baker Island off Bathurst Island, after a snow squall.



Cape Bounty, Melville Island. Desbarats Island east of the Point.

Melville Island.

This island was named by Parry after Viscount Melville of the Admiralty. During the evening we saw Melville island, also covered with snow, and easily made it out, as its outline was familiar and our latitude the same as we had recorded on a former voyage. We began the preparations for landing stores and making a depot. At 11.30 p.m., we passed Ross point; the weather was fine, calm and clear and we could see plainly. It was observed that very little snow lay on the ground compared with the east side. Cape Bounty was passed on the morning of the 27th, and our interest in this cape, was awakened by the remembrance of having read that Commander Parry named the cape, 'Bounty,' because of the reward of £5,000 which was offered to any commander who might reach this longitude. The commander and ship's company received the reward; the cape has retained its name until this day. It is a high bluff with a cairn built on it of stone, by the discoverer. So carefully and judiciously had Parry acted while making his voyage in 1819-20, that it was considered by myself and the officers wise to note particularly the harbours, bays and headlands, as it was our purpose to seek safe quarters for the coming winter. Parry's account during his stay at Winter harbour, was carefully studied, and at 10 p.m., we passed the harbour in which his ships *Hecla* and *Griper* wintered, and sighted the rock resembling a dwelling, in the harbour, upon which Parry had inscribed some reference to his prolonged stay there. The weather being fine, we continued and passed Hearne point, two miles off. The land here is green at this time of the year, with sand patches here and there. A herd of musk oxen were quietly feeding about six miles west of Hearne point; having no time for hunting then, we pressed on and did not disturb the musk oxen. No ice appeared along the coast, but, from the mast-head, we could see signs of ice to the south. The ice was not distinctly observed but the signs so often seen, indicated that ice was making its way along the sound to our south. These signs consist of a whitish glare on the water, land does produce the same effect as it is always dark when viewed. Our latitude was $74^{\circ} 29'$ north, longitude 132° west.

We were now in the neighbourhood of Cape Providence, where the land increases in height. This part of Melville island is much higher than other parts of the coast of the island. The land here is a plateau, but at a short distance inland, gradually rises and rolling hills follow to a height of 1,000 feet. We continued coasting westward until we reached a point 20 miles south of Cape Hay. No ice was visible to the westward, but heavy Arctic ice was seen to the southward; we were then about half-way through McClure strait, and if our instructions had included making of the Northwest passage, I feel confident that it could have been made.

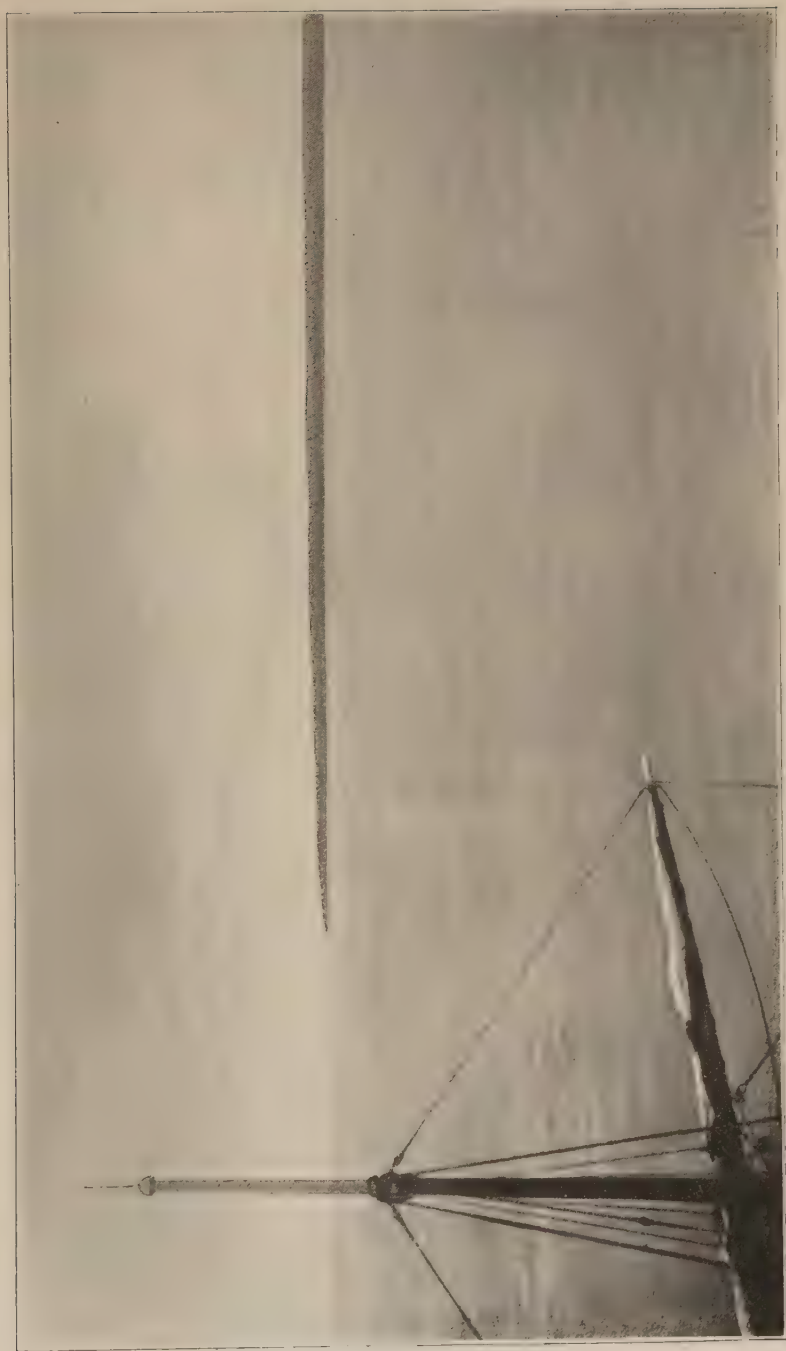
Cache at Cape Providence.

As the passage was not to be undertaken, we decided to establish a depot on Cape Providence, to aid us, if necessity arose, in our exploration in the vicinity of Melville island or further west. During the first part of the night, we landed large quantities of provisions. Soundings were taken, and we found 40 fathoms, the water continuing bold to the shore. When about 3 miles off the shore, at midnight, we saw some young ice, of the previous year. The flood tide runs westward and the ebb tide eastward, and the general outflow is eastward, carrying many large fields of ice, in the fall of the year.

Northwest Passage.

McClure strait is on an average of from 50 to 55 miles wide, and while there, we made use of our camera and secured several photographs. The strait is the proper passage to communicate with Herschel island from the east.

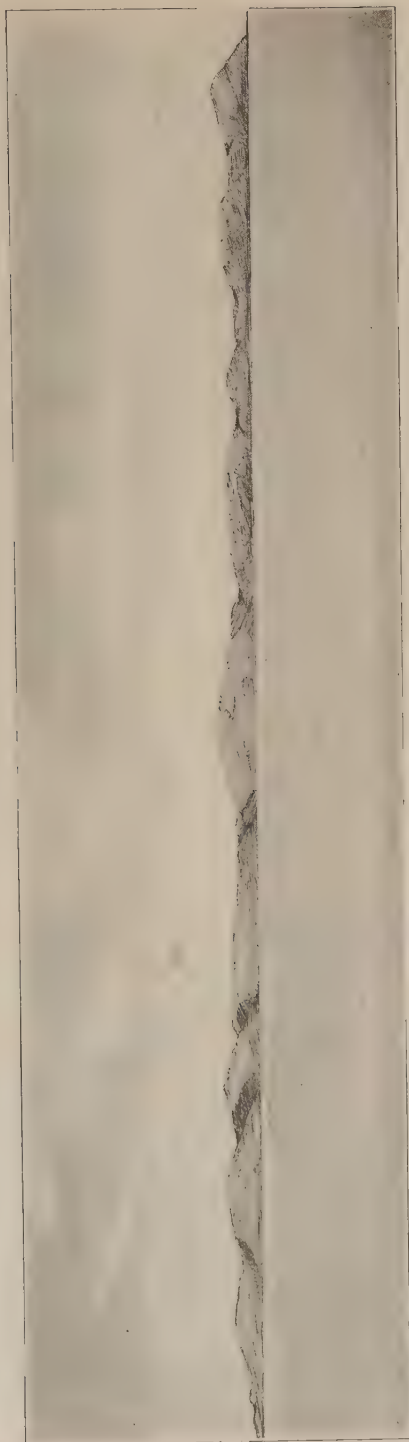
As already stated, we had no instructions to proceed through the Northwest passage, but I may here express the belief that had our object been the navigating of the Northwest passage, the *Arctic* with her equipment could have accomplished it, owing to the favourable conditions which then existed. Having accomplished our purpose in respect of observations in McClure strait, our vessel was put about and we sailed for Winter harbour with the intention of making it our winter quarters.



Cape Hay, Melville Island, McClure Strait. No ice in sight on 27th August, 1908.



Caché, Cape Providence.



Cape Bounty, Melville Island, bearing north east.



Situation of H. M. Ships "Hecla" and "Griper" September 26th, 1819, near Cape Providence, Melville Island.

Anchoring in Winter Harbour, Melville Island.

During the early morning we sighted the entrance of Winter harbour, with no ice in sight, and at 7 a.m., we anchored in 8 fathoms of water, Parry's rock bearing west by north. We prepared two boats to take soundings, to enable us to take the vessel into the harbour with safety. It was necessary to take soundings all along the course before putting buoys in position. The *Arctic* was safely steamed into the harbour without difficulty and anchored in 7 fathoms of water. I immediately visited the historical Parry rock for records. I compared the ease with which the *Arctic* entered the harbour, with the great difficulty of William Edward Parry's entrance, eighty-nine years ago, when he had to cut a channel for over two miles, to place the *Hecla* and *Griper* in safe winter quarters in the same harbour. The rock is of sandstone, and has inscribed on it, the names of Parry's two vessels, as distinct and readable to-day as when cut.

The latitude of our anchorage ground is $74^{\circ} 47' 10''$ north and longitude $110^{\circ} 48' 15''$ west, and the variation on this day, 98 degrees east. The dip was $88^{\circ} 43'$; high water, full and change at 1.30 p.m., and the rise of the tide, 3 feet 3 inches. On the 29th August, the wind was from the north with clear weather, and ice began to make on the beach. Mr. W. E. Jackson, Meteorologist, went ashore to take observations, and Mr. McMillan, Geologist, began his examination of the geological formation of the island and to collect fossils. The lifeboats were sent ashore, in charge of the chief officer, for safety, in the event of fire on board the *Arctic*, and placed on an elevated point north of the ship.

We soon began to realize that the harbour which we had selected was most favourable for adding to our stores large and small game, thereby furnishing fresh meat, so necessary as a change of food from salt provisions. As a first step in hunting, I appointed George Lessard and Napoleon Chasse, quartermasters and good marksmen, to search for food animals and to ascertain the kinds and if plentiful. The chief engineer received instructions to make ready the lamps that would be required when darkness again appeared, and we commenced to

prepare the material for building a cover so that we could work upon the deck during the winter.

Examining Winter Harbour.

An examination of the harbour was an important matter, and I began to familiarize myself with its features as a place of safety for the ship. It was soon apparent that no more favourable one could have been selected in these regions, for it is well sheltered from outside pressure of ice; Hearne point runs in a southeast direction for about 3 miles and Reef point and shoal in a southwest direction. There is an inner harbour, suitable for vessels drawing less than 18 feet of water, with an area of about one mile in length and half a mile in width. Annexed to this report will be found a chart which was made during our stay at Winter harbour. Stone beacons were built by the crew for leading marks for entering and departing, so that a stranger may now enter the harbour by the marks. The leading beacon is in line with Parry rock, for entering, until another range is brought to the northwest leading to another beacon, where a ship may drop her anchor when Fife point is in one with Cape Bounty; on the range, 7 fathoms of water is found. In comparison with Albert harbour, where we had wintered in 1906-7, Winter harbour presented the advantage of more hours of sunshine each day, owing to the land being very much lower, permitting the sun's rays to reach the locality as soon as it appears above the horizon, and in the spring causing an advance of the season. It must, however, be stated that the ice makes to a greater depth at Winter harbour. The vegetation of Melville island springs up earlier than around Albert harbour, Baffin land; this is a great advantage for the herds of musk oxen, deer and other animals found on the island.

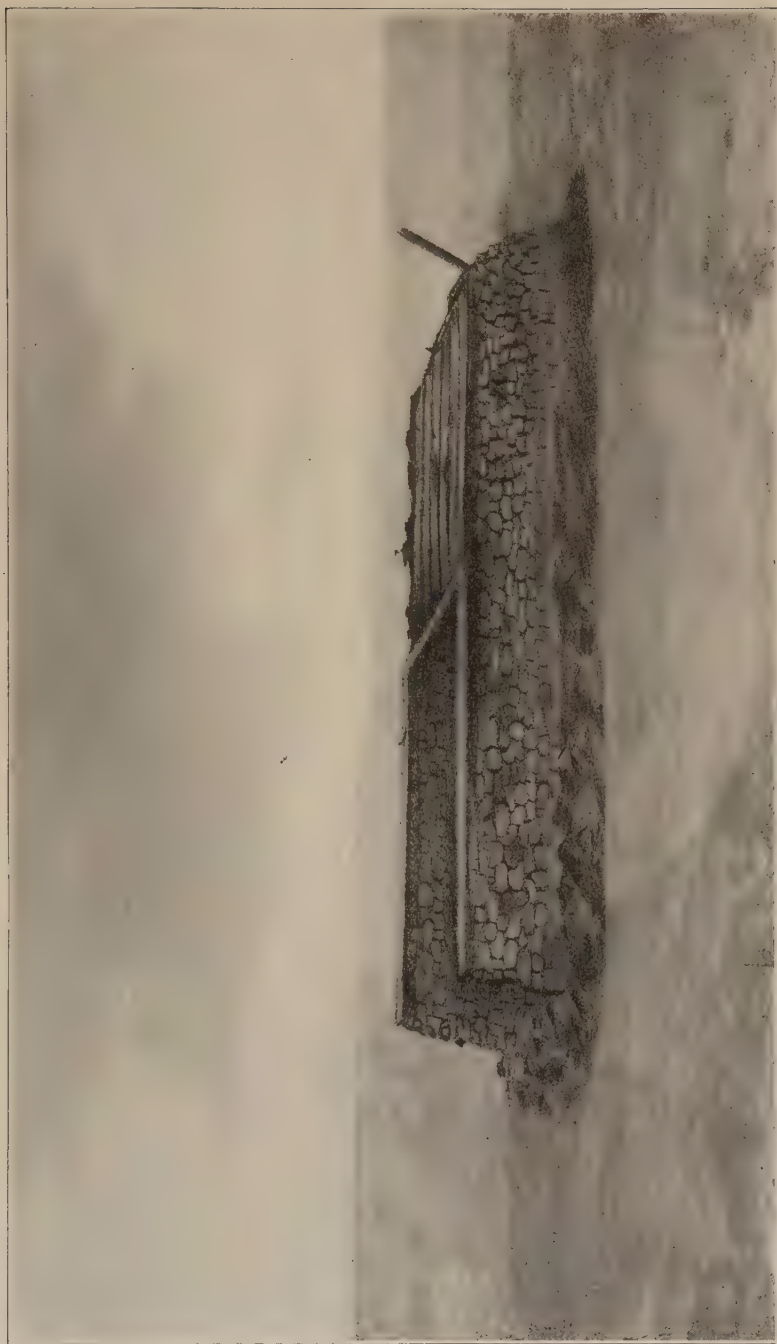
Excursions from the ship were made after our arrival, for the purpose of securing some of the animals. So unaccustomed are the ruminating animals to man that they do not appear timid and were easily approached. Birds do not become alarmed either, as was shown when Mr. McMillan, Geologist, killed three eider ducks with a hammer in his hand. The



The "Arctic" after arrival in Winter Harbour, 1908.



State of Cairn built by Captain Kellett, in 1854. As found by Captain Bernier, in August, 1908, on Dealy Island.



Captain Kellett's Cache at Dealy Island, Before Repairs were Made.



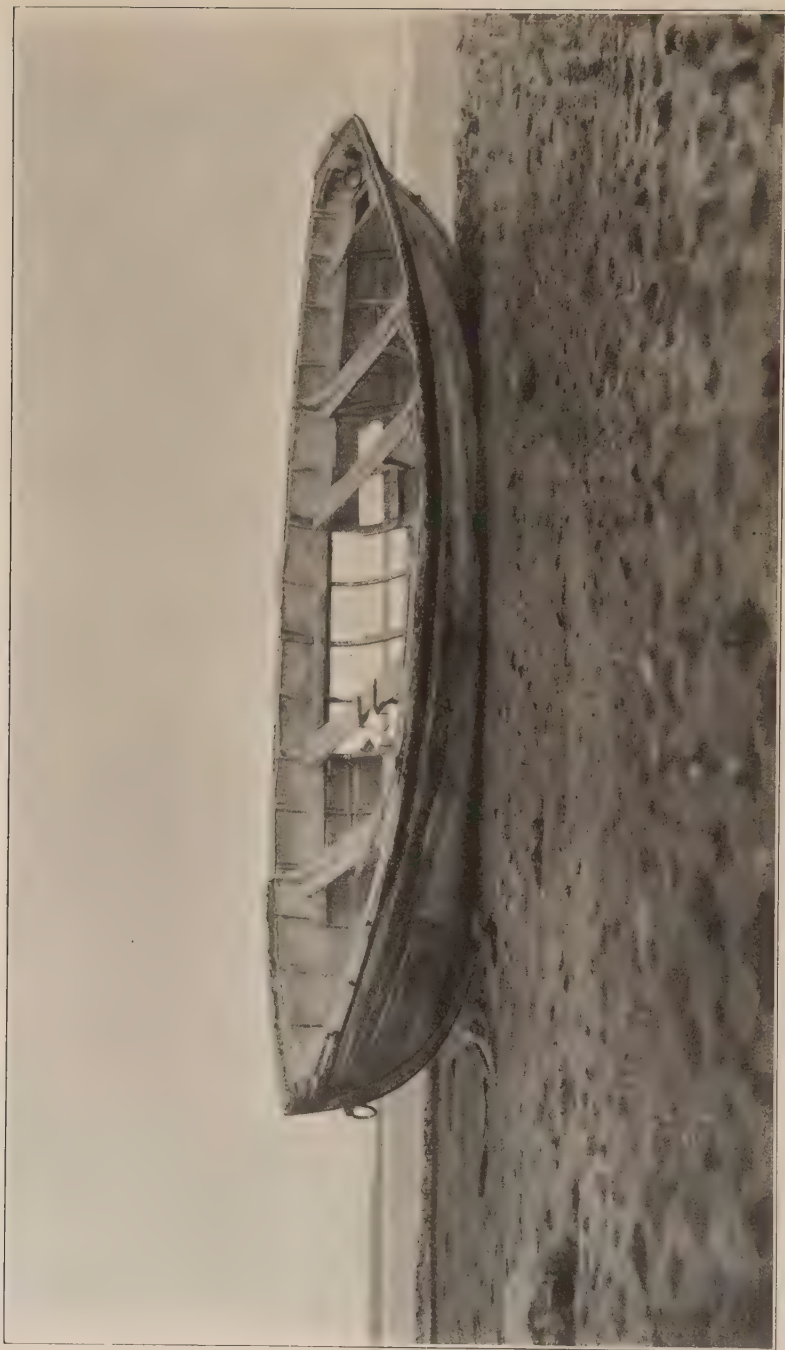
Top tiers of barrels in cairn built by Captain Kellett, in 1854, on Dealy Island.
Found by Captain Bernier, in 1909.

following morning, August 30, a large bull musk ox was killed, by Quartermasters Lessard and Chasse; the meat weighed 430 pounds when dressed.

**Depot of Stores on Dealy Island left by Commander Kellett, C.B.,
in 1854.**

I was aware of the location of a large depot of stores on Dealy island, and wished to know the extent of these stores. On the 30th, we set out in the launch for Dealy island and Bridport, where some soundings were taken at the latter place. The night was fine and the boat made 6 knots an hour at times; the lead was kept going in order that we might have a line of soundings along the coast. The water near the coast is shallow, especially at a point called Halse point, which runs half a mile more to the southward than the chart indicates. At 8 a.m., we arrived at Dealy island, and found the storehouse which had been built in 1854, without a roof. The roof was blown to some distance and was in pieces; there was considerable water on the floor of the building and a quantity of damaged stores. A considerable portion of the provisions was in a good state of preservation; enough had been left in 1854 for 66 men for 266 days. The clothing had been packed in thick oak barrels with iron hoops, the whole arranged according to a plan, a copy of which is annexed. Two muskets were found, but were useless; they were taken by us on board the *Arctic* to be afterwards placed in the national museum. These guns were replaced by two Ross rifles and 1,000 rounds of ammunition. The dimensions of the house were taken, with the intention of building a new roof, when we could afford the time. There was also found one of the boats left by the *Resolute* commanded by Captain Kellett, and the graves with headstones of three men who died on board the *Resolute* and *Intrepid*.

I went to Bridport, taking with me the chief engineer and one quartermaster, to take soundings. Bridport inlet was named by Parry after Lord Bridport. We got not less than 25 fathoms, and observed that the harbour was large enough to hold the whole naval fleet of Britain, the shores being about 300



Boat of "Resolute" left on Dealy Island, in 1844.



Captain Kellett's Cairn, Dealy Island, where his Records were found.



Headstones on Dealy Island of Kellett's men.

feet high and consequently protecting the harbour from violent winds.

We returned from Bridport, calling at Dealy island, where we arrived at 3 p.m. We observed game at Dealy island, but did not secure any animals. We continued our journey, bringing with us two of Commander McClintock's sledges, recognized by their peculiar shape and make. Commander Kellett's record was found by our party in a cairn on the top of Dealy island. We had made a good day's work and were satisfied, having travelled altogether about 90 miles, and arrived at the ship at 10 p.m.

Preparing for Winter and Hunting.

On September 1, we began to build the deck covering and to pile stones for ballast before they were frozen to the ground, so that they could be carried during the winter, to replace coal and stores consumed, to keep the ship in trim. At 10 a.m., the following day, I left with the launch to go westward about 6 miles to take some soundings and to intercept a herd of musk oxen we had previously seen. In two hours we killed sixteen fine animals, only one being unfit for food and that because he had been fighting and had a large hole in his side; putrefaction had set in. Two of the animals only were skinned at the time; the wind was blowing fresh from the southeast and our boat was in a dangerous place; it was, therefore, considered unsafe to remain, and a snowstorm hastened our departure. We returned to the ship wet and tired from chasing the musk oxen and dispatching them.

The chase was almost an absolute necessity in our situation. We had before us a long winter, with 43 souls on board, in an Arctic climate, where nature demands animal food containing a large amount of fat, to maintain within the body sufficient heat to withstand the rigours of the winter, whilst moving about outside the ship. We had an abundance of salt meat, both in pickled and canned, but had not sufficient fresh meat. With the continuous use of salt provisions scurvy would be inevitable, hence the necessity for providing a good supply of fresh meat of the kind which the region afforded. Fortunately we had no difficulty in securing animals that were in prime state.

Hunting Musk Oxen.

As these were the first experiments in hunting the musk oxen, I selected the men that I considered good marksmen, but even from this starting point, it was necessary to learn how the animals could be approached. To our surprise, they did not show any fear, but continued quietly grazing, and permitted us to fire upon them. Our first adventures were with a few oxen, which we had no difficulty in securing. I have already referred to the sixteen animals of this kind which had been killed on our excursion to the westward, but at this stage of the narrative it may not be out of place to describe the habits and instincts of the musk oxen which we hunted and which supplied such a large part of our fresh provisions. We were not long in discovering that the use of the Winchester 303, with an explosive bullet, was the most effective rifle and in the end the most merciful way of despatching the animals. The male animals only, when wounded with any bullet, will make an attempt to escape or attack its foe. Their greater vitality and strength, enable them to make furious efforts after being shot, and they will keep upon their feet when severely injured. In large herds, they are far easier secured than when in single numbers. Instinct seems to lead them to be less fearful of a foe when they are in numbers, and they hold their ground. No doubt when attacked by other animals, their method of protecting themselves is effective, but it has less to be said in its favour when men with firearms are its foe. Single oxen, or a few in number, take the wiser course of keeping at a distance or make an attempt to escape. The leader of a herd or one in possession of his full strength, is always in advance of the others, and from the sense of danger, if there be any danger, which they seem to possess in a land where ravenous beasts are in numbers, return and warn the herd, which stops. The scattered ones are rounded up by the leader, who pushes them or horns them into the group. If no danger is apparent, the herd follows the leader along their accustomed grazing districts or paths. When a foe appears, the herd forms a partial circle with the male animals on the outside of the circle and the female and young within, or in the rear. The leader occupies



Musk Oxen, Melville Island.



Musk Ox shot on Melville Island.



Musk Oxen killed by Captain Bernier and men, 1908.

the most dangerous position, and if killed or overcome, another male takes his place and so on. We observed that the leader would make an occasional charge, when attacked by any of our party, but instead of a direct or straight charge, would make a semicircle and return to his post. In our first hunting trips the animals were not apparently alarmed at our approach, and I may say the men were more afraid of the animals than the animals of the men. From an elevation I witnessed an attack by a party from the ship, and to me it seemed as if the oxen were marshalled by the leader when facing the foe, and when he was killed another male took his place. The herd was always more easily secured by at first killing the leader and his successors.

The most vital spots in shooting are the chest or fore shoulders, but even if hit in those parts, a male musk oxen may run for some distance with two or three explosive bullets in him, before he falls. When assailed by a number of hunters they are apt to stampede, but the rush is of short duration for they will again make a stand until too hard pressed.

We afterwards learned more of their habits and of the grazing grounds, and will refer to these in the following pages of this report. The meat is quite palatable in the fall of the year, but the hide must be taken from the animals shortly after they have been slain, otherwise the meat becomes less palatable and the odour from it disagreeable.

On September 2, we prepared several boats, and left the ship to bring on board the sixteen musk oxen which had been killed the day before, while one party went overland to skin the animals. The launch was this day put in commission, but with the erratic motor power of gasoline launches, the combination refused to work after the ship was left, and consequently the launch remained anchored in the bay all day.

The effort to bring in all the meat was unsuccessful, but a large part was conveyed by the boats to the ship's side. The work of carrying the carcasses to the boats, was done under difficulties as well as making the trip overland by the party that walked to the place where the musk oxen had been intercepted and killed. The mud clung to our feet, making it



Picking up Coal on the Beach, Melville Island.



Searching for Specimens of Natural History.

difficult to walk even without carrying weight. As the result, all of the party which went for the dead musk oxen were tired and wet on arrival at the vessel; they soon felt the cheering and comforting effects of a drink of punch and change of clothes. Part of the meat had been left, but on September 3 we again set out to bring to the ship the balance; at the same time Mr. McMillan, Geologist, Quartermaster Lessard, Reuben Pike and myself proceeded to skin the last musk ox that had been killed and took it to the shore for shipment. On this day also, the second and third officers and the boatswain started to bring their boat to the ship, which had been left at a point the previous day.

Coal Found.

Before returning to the ship we found coal on the shore of a small frozen lake, and tried it, finding it burn satisfactorily. Our purpose was to search for coal, which might be used for fuel during our long winter stay at Winter harbour, and any evidence of a deposit, in considerable quantities, would be hailed with pleasure as it would enable us to husband the stock on board. We did not, however, meet with much success; our search in different parts of the island resulted in finding only 100 pieces of coal altogether. Coal had also been found at Byam Martin island and a few pieces at Hotspur point. How the coal came to these places cannot, so far as I am aware, be accounted for, unless by the ice bringing it ashore from some deposit along the shores or under water. It is similar to cannel coal and burns very well.

Peat.

Mr. Vanasse, the historiographer, on one of his excursions found turf or peat. Some of it was brought on board and tried; although only partially dried, it was found to burn very well. Quite a considerable number of turf or peat bogs were noticed, but in patches and scattered. The supply would be sufficient for a number of people for fuel if properly dried. A sample was brought from Melville island with other collections to be deposited in the museum.

CHAPTER II.

Discovery of Documents.

The well-known practice of depositing records by Arctic explorers, with a view of informing those who follow of the discoveries made and prospective movements of their ships, led me to search for records. The reports of early discoverers inform us respecting the deposits of records in cairns or the burial of them in specified localities, and, by certain of the directions, I was able to discover a large number of important documents containing extremely interesting and important facts about events in northern waters. A list of these documents will be found in another part of this report. In connection with the discovery of documents, I may here remark, that we found in a cairn on Northeast hill, a parchment containing a brief account of the discovery of Melville island and adjacent islands by Parry in 1819-20. Kellet wintered in Dealy island harbour in 1852-3, and it was on Parry's rock in Winter harbour he found McClure's record, by which he learned that McClure's ship, the *Investigator*, was in Bay of Mercy, Banks-island, where she was afterwards abandoned. The record which Kellet found was left by McClure, who went to Melville island over the ice, to ascertain if any vessels had arrived at that place. On the same rock I found Captain Kellet's record of the year he wintered in the ice pack off Byam Martin island, and, in the same box, I found a record left by Lieut. Meham, who went into Prince of Wales strait to look for Captain Collinson of the *Enterprise*.

Records of Commander Parry were also found on Northeast hill on September 4; accompanying me were Mr. W. E. Jackson, Meteorologist, Quartermasters Lessard and Vignault. The records were taken from the cairn and carried to the ship, where they were opened and several coins found. The parchment was a record of the discovery of nine islands, which were named by Parry, Georgian islands, in honour of the then reigning king, Georges III.

On our way going back to the ship we killed thirteen ducks. Shortly after our arrival at the vessel, the officers who had been sent to bring on board the balance of the sixteen oxen, returned, carrying the few carcasses and all of the skins of the animals. A regrettable incident occurred during my absence from the ship. Some of the ship's company which remained on board were indulging the desire to shoot something, alive or dead, and practiced upon one of the buoys, which they pierced and it sunk. They were sent out to raise it and replace it, as it was a guide to show how close the ship swung to a four-fathom patch in the harbour.

September 5 was a fine warm day; most of the hands were employed in unbending the sails and putting them away, as they were then dry and in a suitable condition for stowing. We also took advantage of the fine weather to resume our search for coal along the shore; accompanying me were Mr. Jackson, Quartermasters Lessard and Chasse. At Reef point, about a mile away from the ship, we found some coal on the beach; these evidences of coal continued all along the shore of the bay, but the largest quantities occur on the east side of the point, apparently shoved up by rafted ice; from this we concluded, deposits of coal occur not far from Reef point.

In preparing this report, it has been my purpose to narrate events which came under my own observation in our efforts to acquire knowledge of the region which we were exploring, and to note anything that I believed would interest navigators, scientific men, and the general reader, in our far north land. The natural history, geological, meteorological and magnetic reports, contain information of a technical nature. Some of the fossils, natural specimens, animals and birds secured by myself, were handed to the gentlemen who were specially chosen by the Department of Marine and Fisheries, to give attention to the work of making scientific observations and a collection of the flora and fauna, of the places visited. Shells, fish, coal, peat, relics, drift and stones of various kinds were picked up, until I had quite a collection, part of which was also given to the staff referred to, who added them to their collections. A large number of fossils, stones and pieces of

coal and other articles were held by myself, and since placed in charge of the museum authorities in Ottawa, and named *Arctic's* collection of Captain Bernier.

Returning from Reef point, black ducks were observed in considerable numbers, and we had the good fortune to kill seven of them. The land was bare of snow, but the grass and flowers were fast fading away; of the thirty-six varieties found on Melville island, Mr. McMillan's report contains a description.

The search for coal was continued around Reef point, as I had heard from one of our company, that coal was visible near a little lake at the back of Reef point. It was true—a seam 6 inches in thickness, running northeast, could be seen, but the coal being surface coal was nothing more than smut and not worth digging. An attempt was made to follow the seam downwards, and several tons of shale, rock and clay were excavated, but no coal deposit was uncovered.

Preparing the Ship for Winter.

The carpenter and his helpers were busy roofing the deck for winter, and other preparations were made. The days were favourable at this time, September 6, both on account of the fine weather and their length. The daylight continued until 10 p.m., with twilight until 10.30 p.m. The darkness of the night resembled twilight more than the usual darkness at other periods of the year.

All hands had been kept extremely busy from the beginning of the voyage, and each one felt the need of a day's rest, but before entering upon it, Doctor Bolduc reported that the ship's company was well notwithstanding the continuous exertions and anxiety inseparable from Arctic navigation. Religious service, conducted by myself, was held on Sunday, September 6, which was well attended by the officers and crew.

Cairn Established by Captain Kellet, 1854.

September 7 was fine and calm, and the day was occupied by parties in boats sent to different parts of the harbour. The boat in which I went to Reef point to search for coal went also on a visit to Fife point, where a cairn established by Captain



Cairn of Sir W. E. Parry, built 1819-20, on Table Hill, eight miles from Winter Harbour. Records found in 1908, by Commander Bernier.

Kellet, of the *Resolute*, in 1854, was examined. In it we found several barrels which had contained rum, sugar and tea. The rum had leaked out; the sugar was partly melted and unfit for use; the tea remained, but was so much injured that it was of no use. The barrels had the appearance of being injured by animals, probably bears; they were rolled out of their original place. No documents were found, and it was only by a study of Captain Kellet's published records that I arrived at the conclusion that the depot had been left by him. As in the case of every other interesting object or cairn, a photograph was taken of this depot, and the picture is one of the illustrations of this report.

Advantage was taken of every fine day to acquire knowledge, and on September 8, Mr. W. A. Jackson, Quartermaster Chassé and Frank Hennessey went on the hills at a distance to hunt animals and birds with the intention of making a collection of skins for the museum at Ottawa. They secured a few specimens after a long tramp, and acquired some knowledge of the island. We had a two-fold object in making excursions from the ship: one was for the purpose of getting fresh meat and the other to gain knowledge of the animal and bird life of the island; it may be added that numerous traces of animals were observed.

The work at the ship for winter preparations progressed, and constant observations seaward were made; in the Strait no ice was seen.

On September 9, the wind was strong from the eastward, cold and raw, and similar to the wind from the same quarter on Baffin land, Greenland and all the northern regions. The western winds are practically warm winds and the temperature more comfortable.

Mr. Jackson, the Meteorologist, with aid from the ship, put up our self-registering instruments to show the force and direction of the wind. Carpenter D. Gagne, Seaman Bouchard and myself worked all day at the deck covering, in view of completing the work properly. Electric lights were kept burning every night until about half-past nine, when the steam was shut off.



Remains of Cairn built by Capt. Kellett, 1854. Found in 1909 by Commander Bernier.

Regulations.

Discipline suitable to our new mode of living, namely, in an unmovable station, was necessary with regard to light, cleanliness and exercise. One of the regulations required the ship's company to be in bed at 10 o'clock and all lights out at 10.30. The quartermasters took turns as watchmen; one watched until 12 midnight and another until 6 a.m. At this hour the cook rose to prepare breakfast for all on board.

We brought with us from Quebec four pigs, and these were now killed and hung in the rigging. With the temperature far below freezing, the rigging was equal to any refrigerator, and with the pork and 3,600 pounds of fresh musk ox meat, we felt that we would not be limited to salt meat in connection with our provisions. Orders were given that fresh meat should be served all on board two days a week, as a sufficient precaution against scurvy, in the first place, and then with a view of using our store of fresh meat prudently.

Approach of Winter.

The wind came into the northwards with signs of winter, and while all the gear was dry we unrove it and stowed it away, making everything snug. Up to this time, my room had been in the deck house, as a matter of precaution and safety while navigating the vessel to the points we had reached. The life was rather of a hermit nature; orders were given to clean my room in the cabin and put it in order. I found the exchange of quarters more agreeable as I came in contact with the officers and found the social conditions more pleasant, after the long strain of the voyage outwards.

On September 11, quite a decided change in the appearance of the bay took place; the wind had set in from the north and had driven the ice made seaward into the bay, but the strait was free of ice as far as the eye could see. Although this was the case, we could not fail to observe that winter was fast approaching, and reminding us of the early part of winter at home. Sunday, September 13, was fine but cold; the ice was two inches thick, and no water was visible from the deck, the vessel being frozen in at anchor, heading north-northwest. The

ice, at this stage, was not sufficiently strong to go on shore, and orders were given that no one should leave the vessel while it was dangerous. The ship was now out of danger, relieving the anxiety which we felt during the voyage to Melville island, and every one on board could enjoy the night's sleep without any apprehension of danger and free from night duties.

On Thursday, the 14th, the wind was from the northward, light and the weather clear, but there was much moisture in the air, which indicated a large body of water in Liddon gulf and farther north, the hoar frost on our rigging confirming this opinion. The sun set clear and fine, the star arcturus was visible in the northwest; the moon rose beautifully bright, and with the ship frozen in the bay in three inches of ice, these accompaniments of Arctic weather, led us to contemplate another long dreary stay in the silent northern archipelago. At this time we landed to take magnetic observations.



Remains of Cairn Left by Kellett, 1854.

CHAPTER III.

Discovery of one of Parry's Records.

It was intended to permit the staff and men to make excursions from the ship, not only for exercise but to become acquainted more thoroughly with the island, and I realized the danger of straying out of sight of the ship. One staff and flag was erected on the North hill, a row of staffs was placed as guides to the observatory and a number were placed at different points and elevations.

On September 15, a party was sent to get a record left by Parry in 1820 on Table hill in a cairn. The cairn was about 8 miles distant, and was on the southwest corner of Table hill. The document found is of parchment, and contains a record of an attempt to discover the Northwest passage, and describes the entrance of the *Hecla* and *Griper* (the first ship commanded by Parry and the latter by Lieut. Liddon) into Lancaster sound and a continuation westward through Barrow strait. Barrow strait was named by Parry after Mr. Barrow, Secretary of the Admiralty. Nine islands were discovered and named New Georgia and then North Georgian islands, in honour of King George the Third. It states further that Lancaster sound and Barrow strait were found to give an entrance from Baffin bay into the Polar sea. This parchment is signed W. E. Parry and Mathew Liddon, and is in an excellent state of preservation. A copy of it will be found in this report with copies of other documents discovered.

From Table hill there is a splendid view extending as far as Liddon gulf, about 20 miles distant. The country between the hill and gulf is rather flat but undulating, with the exception of a ridge which runs northwestward from Cape Bounty. On Table hill a record was left by Mr. W. A. Jackson in the place of Parry's record.

The following day broke fine and clear but frosty, and to our eyes was presented a charming sight caused by the sun

shining on the rigging, which was covered with hoar frost, and making the vessel appear like a glass ship. The ice increased in thickness, rapidly fastening in the ship, so that there was no longer any necessity for leaving our anchors down, and we accordingly lifted them. The weather, however, became threatening, and no one left the ship. During the following day fine snow fell and continued to fall, but on the 18th (September) it cleared, and in the morning about 9 o'clock, we were pleased to see three large musk oxen, sighted first by Quartermaster Vigneau and near Parry's rock. I at once sent six men to secure them, which was successfully done, and their carcasses added 1,200 pounds to our stock of fresh meat. Up to this time we had increased our provisions by securing 12 ptarmigan, 58 ducks and 2 deer. All of the meat and skins were hung in the rigging, resembling a butcher shop and furrier's store combined. Whilst stripping the ship and preparing her for our winter's stay we had seen a large number of lemming on the ice. These little animals resemble rats without tails, but they feed on vegetable matter and become very fat. We had noticed the remains of the small creatures lying in places where they had made a meal for large animals.

Issuing Warmer Clothing to the Men.

September 19 ushered in a snowstorm with a wind blowing about 50 miles an hour from the north-northeast, but we were not disturbed by it on board as we were well protected. The weather, however, was becoming very winterish, and heavier and warmer clothing was issued. The weather having cleared, several with myself, sauntered out on the 22nd towards Point Hearne to ascertain the condition of the ice in the Strait and for collecting natural objects, but found very few specimens. Among those few were some shells picked up on the beach resembling small clam shells and of an oval shape.

Mr. McMillan, while pursuing geological searches, sighted some musk oxen and deer in a north-northeast direction, but did not kill any of them. The information given by him induced me to send out four men provided with food for eight days, to hunt for the animals. On the same day at 3 p.m., I



J. Bolduc, Medical Doctor of Dominion Steamer "Arctic" in Arctic Clothing.

saw a large number of deer, and a party under second officer Morin hurried off to secure them or some of the herd. They returned at 7 p.m., and reported that they had killed thirteen deer and more than that number were in sight. The next day being fine and clear, I sent most of the officers and men with four sledges to bring the deer that were shot to the ship. Fourteen carcasses were conveyed on the sledges; the weight when dressed was 1,237 pounds; but five more that had been killed were left for a future trip, and were afterwards brought to the *Arctic*. The men were encouraged to increase our supply of fresh meat, and they also were fully alive to the benefit it would be to themselves in the prevention of scurvy. Spirits were not served regularly to the officers and men, but on certain occasions a small quantity was given, and I may here add, that those who were not teetotalers appreciated a glass of spirits on the return from bringing in the deer meat. During the day the chief engineer, two others and myself, took a flag to place on Northeast hill to be a guide to find the ship for the parties who went hunting. From this hill, we saw about sixty deer in a northeast direction, and a number of musk oxen towards the east. These animals, while going in the same direction, kept in separate parties on the way inland from the coast, seeking the ravines, depressions and sheltered sides of hills. They are guided in their habits by a sense of danger, and seemed to have learned, from disagreeable experiences, when storms are approaching or winter is coming, and protect themselves as far as possible by taking shelter.

From Northeast hill, we were able to view the ice in the Strait, and observed that it was all sheet ice, with open water here and there, showing that the strait was navigable up to that time. As a matter worthy of note, I recorded that sunset took place on this day at 5.30.

September 26 being the anniversary of the entrance of Sir William Parry into Winter harbour, we raised our flag in honour of the brave mariners who discovered so many of the islands of this Arctic archipelago. I took advantage of the occasion to refer to the bravery and courage of the early mariners who had endured hardship in their voyage of discoveries, in the same waters as we were now exploring, and commended

their example to the men on board. The life on board ship, in Arctic regions, where men are frost bound and in darkness for over more than 90 days, is by no means a pleasant one. It, therefore, was considered my duty as commander, to employ every means to encourage the men to look forward to accomplishing something that will be recognized by their fellowmen as more than an ordinary voyage. To look with pride upon the fact that the early discoveries made by Parry, while looking for the Northwest passage, are now yielding a practical result by enabling the *Arctic* expedition to annex all islands and land as far north as the pole, to Canada.

The land on the 27th was covered with snow, except Parry's famous sandstone bearing southwest from the ship. The flags that we had placed were waving in the distance, and the scene was inspiring, as they reminded us of civilization and a common occurrence of home life. Mr. McMillan and his party returned from the north, and reported having killed five musk oxen and six deer during his expedition, but it was not necessary for us to secure them on that day. September 28 was fine, with light wind from the north. The chief officer, with Mr. McMillan and 18 men, left the ship to bring the musk oxen and deer killed by them to the ship, but the day was not favourable, as frozen fog hung in the air and the party found it difficult to reach the point for which they had started; it was 4 p.m. when they arrived on the spot where the game lay.

Difficulty of Hunting Party in Reaching the Vessel.

The hunting party sent to bring to the vessel the dead animals already referred to, killed twenty-three additional deer, and after a number of these animals were skinned, they started to find the ship, but it was not an easy journey. At 6 o'clock there was no sign of them, and being apprehensive, I sent several men out with lamps. The second engineer and myself went up on North hill with lamps and torches, which, happily, were seen by the returning party, and they found the way to the vessel. Being unable to answer our signal, I was not aware that our torches had been seen, and continued to search until 11 o'clock. On my arrival at the ship, I was relieved of the anxiety, and was pleased to learn that the hunting party had

safely found the *Arctic*. The following day was occupied in bringing in the animals shot by the party of eighteen.

A considerable quantity of ashes from the furnace of the *Arctic* had accumulated on our voyage, and the men were set to work sifting these ashes, in which they secured a quantity of cinders and coal which had dropped through the grate. This was used as fuel in the stoves for heating the vessel; a sufficient quantity being obtained to last until January.

The month of September was remarkable for the appearance of animals on Melville island and the success in hunting them. The meteorological table and tide tables in this report will show the daily records of the weather and rise and fall of the tides during the month.

Trapping Foxes, Sight of Polar Bears and Wolves.

The month of October opened with fine weather, and gave us opportunity to make magnetic observations from the observatory, located about 3,000 feet from the shore. Observations of the ice in the strait were made from Northeast hill, about 3 nautical miles away, and upon it was flying one of the flags that we had placed. On October 2, the third officer and a party went out to bring in the meat of the animals which had been killed, and on the way noticed the track of a bear along the side of the ship. We picked up the bones and refuse and set a trap to catch him, but did not succeed; on the 3rd, however, Joseph Lessard and I saw him coming towards the ship, and prepared to meet him. As it grew dark before he came to the ship's side we lost sight of him, but heard his steps on the creaking snow as he approached. Our wait lasted two hours, and when he began to crack the bones thrown from the ship, we both fired at the same time from the poop, although he was not visible. On the 6th of the same month, while examining the harbour, I noticed a bear lying down and apparently wounded. I sent the second officer and two men to despatch him, which was an easy matter with one bullet, as he was exhausted and weak from loss of blood. The bear had been hit in the body by one of the bullets fired in the dark on the 2nd from the ship. On October 7, two more bears paid us a visit; they were pursued by several men,



Bear killed by Napoleon Chassé.



Reuben Pike, waiter on board "Arctic," and Live' Fox.

who adopted the wrong method, for, instead of allowing the bears to approach to within a short distance they fired at them when at too great a distance and alarmed the animals, and they made off. At this time, I sold 100 fox traps at cost price to induce the men to go out daily for exercise in order to keep them in a healthy condition. Quite a rivalry existed between the men in this engaging exercise, and frequent excursions were made to examine the traps; some men were fortunate and secured a number of foxes, whilst others failed, but all were keen and followed up the exercise. On the 8th, we saw six wolves, which were chased by Mr. Jackson, Quartermaster Chassé and myself, but these animals are cowardly and swift when pursued. They are of larger size and leggy compared with wolves in the several provinces south.

Mr. Green, the third officer, who was out in charge of a party, reported that deer abounded and foxes were plentiful; wolves came alongside every night; we thus learned that Melville island supported a great number of various kinds of animals.

Health of the Ship's Company.

The doctor made an examination of each individual on board, and remarked when doing so that pimples were appearing on some of the crew. This was attributed to neglect in changing their clothing, and an aversion to the use of proper precautions in the matter. In the Arctic regions there is a disinclination on the part of some individuals, owing to the cold, to take baths. Orders were issued for all on board, to exercise the utmost care with regard to cleanliness. This order was not necessary in most cases, but the precaution against the breaking out of any disease compelled the most rigid observance of rules for baths and changing of clothes. The rule applied also to bed clothing, and reporting any dampness observed in the sleeping apartments. The men were given a half holiday on Saturday for washing their clothes.

CHAPTER IV.

Tidal Observations.

The chief officer, with Mr. W. A. Jackson and Mr. McMillan, were entrusted with the work of registering the tide, and on October 8, a galvanized iron $\frac{3}{4}$ -inch pipe was dropped through the ice and 8 feet below. This pipe was filled with kerosine oil to keep the water from freezing; inserted in it was a wire with a weight of 60 to 70 pounds of cast-iron at the bottom, and as the ship rose and fell it registered the tide on a board in the ship. The observations were taken every hour, and ten minutes before and after rise and fall. The record was kept by Mr. Jackson, the meteorologist and magnetic observer. The chief officer, Mr. Jackson and Mr. McMillan, were occupied during the whole winter at tidal observations, besides taking an occasional observation during the day.

The moon at this time shone out clear, and we enjoyed looking upon her as she ruled the night during winter. The face of the moon is far more admired and welcomed than in southern latitudes, as she sweeps the horizon and remains in sight nearly twenty-four hours. On this day, the magnetic observer ascertained the amount of electricity in the air during one hour, the wind blowing 45 miles an hour. We had now begun to prepare the sledges for the spring work. Tests were also made of sleeping bags; feather down bags were pronounced the best, with a blanket. A full inspection of the vessel was made at the end of every week; she was found practically tight; the rooms and all quarters were inspected, washed and cleaned; the upper and lower decks also were made clean and tidy, and all quarters found warm and comfortable. The consumption of coal was 1,700 pounds per week.

October 11 being Sunday, religious service was held, and well attended by the officers and crew. This day whilst up on the West hill, about $2\frac{1}{2}$ miles from the ship, I saw water in McClure strait, showing that the strait was still navigable for

vessels. On the 12th, we began building an embankment outside of the ship, starting about 9 feet from her sides and running her whole length; by this means the vessel was made warmer and all kinds of storms were unheard. The work was under the second officer, and gave employment to the men of the crew who were not engaged in special services. It had the effect of making the days pass more quickly, and kept the men in better health than if idle.

Mr. Vanasse, the historiographer, and the second steward, went to a hill for observation and for the collection of natural history specimens. In connection with these excursions, I found it was not safe for an individual to go alone, consequently issued an order directing that any of the ship's company must be accompanied by one or more persons.

During the week, we killed four large deer, and these were brought on board by men in charge of the second officer. I was fortunate enough to trap a small white fox; this was kept to present to some young person on my return, as a memorial of our voyage. Traces of wolves were seen by the second officer, but none were killed at this time. As the days were now only a few hours in length, the instruments which had been used by the meteorological observer were brought on board, the fall observations having been concluded. We began hauling fresh water ice on sledges made by the carpenter and myself. Our water supply was obtained by melting the ice in tanks, erected above the galley stove and the stoves used for heating the vessel.

Establishing a Depot.

The ice was now strong enough for landing supplies, and we conveyed about one month's provisions to a place not far from the ship in case of fire, and built a snow house for their protection. We now had a succession of depots from Winter harbour to Ponds inlet, which would be useful in case of the loss of the vessel by fire or other casualty. In the northern regions, no ship is safe, hence the necessity for establishing provision depots at a number of places, to lead to points where there is some probability of finding a vessel at whaling or sealing stations. These stations were established at Cape Provi-



White Fox in Trap.

dence, Dealy island, Port Leopold, Erebus bay and Ponds inlet, our rendezvous.

On October 16, the day was clear; we could see a long distance, and observed what appeared to us to be land, in a southerly direction. The appearance agrees with the narrative of Commander Parry, but I cannot vouch for the certainty of land, as it might have been refraction of the earth's surface. However, discoveries of portions of Banks island were made by exactly similar appearances.

Pursuing Bears and Trapping Foxes.

At 9 a.m., of the 16th, two bears were seen on the ice at a distance of about one mile away; six men were sent to endeavour to shoot them, but the bears retreated, no doubt considering six men too formidable a foe to attack. The party returned to the ship, and reported that the bears escaped by water beyond the reach of their rifles. My object in sending several men to endeavour to kill the bears was more for the purpose of accustoming them to facing these dangerous animals in the event of a sudden attack. The training is valuable, as it induces courage and gives familiarity with danger in facing wild animals like the Polar bear. A small Eskimo boy of fourteen, with a gun and ten yards from one of these animals, is without fear, and very seldom misses his aim. The Eskimo use cunning and show great nerve when hunting bears. They dress in sealskins and lie in one spot, allowing the bears to approach them unsuspecting of danger, and when bruin is close enough to make the aim perfectly sure, the Eskimo shoots and invariably lays the animal out within a few feet of himself, either dead or so nearly so that not much trouble occurs in entirely despatching him. In the case of whitemen, with different clothing from the Eskimo, when in numbers, the animals become suspicious and retire, unless the men come suddenly upon the bears, and then they are apt to attack, if male bears, while the female bear is only dangerous when accompanied by her cubs.

On the 17th, being Saturday, the men were allowed to set their fox traps all around the harbour in places allotted to them and staked off. Fox trapping was one of the means used to induce the men to take exercise, and they readily entered

into it with a spirit of emulation and for the pride of being able to count as trophies, the greatest number of fox skins. The exercise benefited both mind and body. Trapping or hunting seemed the most effective way of inducing the members of the ship's company to go abroad from the vessel. Young Mr. Hennessey killed eight ptarmigan that were in a very fat condition.

Sun and Moon Shining Together.

The most remarkable occurrence about this time, October 18, was the shining of the sun and moon brightly at the same time. It is true the sun had not its usual bright light, but the moon was unusually bright, and we began to realize what a valuable companion the moon is in far northern latitudes, and to learn that she reigns by day as well as night to dispel total darkness. In the last quarter although but a small part of the moon is seen, her reflection in the day is not made invisible by the more powerful light of the sun.

Winter harbour has an advantage over Ponds inlet, due to the absence of high hills or mountains like those which surround Ponds inlet. Daylight is accordingly longer, and many advantages are seen, especially the earlier spring, causing earlier vegetation.

On October 19, the sun set at 3 p.m., but we had twilight about two hours. During the following days of the week some of the men were employed at the snow embankment, others cutting ice off the rudder well, a few making sledges and some repairing sails and making a cover for one of the large sledges to use in the place of a boat for travelling purposes.

The long evenings were passed in playing checkers, cards and similar games and in reading. I wish here to record the generosity of Mr. Ellis, a coal merchant of Quebec, who furnished a large quantity of reading matter of an instructive and entertaining character. The men were quite pleased to have the books and papers, and made good use of them.

Quartermaster Vigneau and I went off from the ship along the coast, and in our ramble, saw ten wolves, but their speed was so great that we had not the slightest chance to aim at them, and in twenty minutes they were out of sight.

The men reported having saved 42 bags of coal from the ashes by sifting, and owing to a remark made by one of them that working amongst ashes was dry work, they received a portion of spirits. Some of the men were now employed in building igloos for various purposes; others visited their traps. Amongst them several had taken foxes and were in good spirits, whilst others were not so fortunate. If a sailor while in the Arctic regions is given a gun and a trap, he is made happy, and what more can be done for men anywhere than to make them happy.

Movements of the Ice in the Strait.

On October 23, the chief officer and a quartermaster, by direction, placed some flags in the ice outside of the harbour, to indicate in which direction the ice was moving in the strait. On the following day it was observed that by the movement of the flags, the ice was drifting to the eastward, showing that McClure strait fills from Beaufort sea during the fall, and finally closes about the first week in November. There was only a small lead of open water about 20 feet wide along the coast. Numerous tracks of bears were seen along this lead, showing that no open water could be found by them elsewhere, and that the ice was fast closing up to Melville island from the outside pressure. The wind was from the north, or, from off the land, and would have driven the ice to the south, if the strait had not been choked with ice. On the 24th, the day was clear, giving a splendid opportunity to view the strait from an eminence, and I went to the top of West hill for the purpose of looking seaward, also for a view of the surrounding country, but nothing special was seen from the hill; we, however, determined the fact that no part of the strait was navigable. At 2 p.m., the sun was sinking near the horizon and narrowing our days.

On this day also, the chief officer and two quartermasters went out on the ice floe, and found that the ice had stopped moving; they observed several pieces of heavy ice, indicating the movements of the ice from the polar basin towards the Atlantic. The polar basin having a higher level, the water runs towards the east and south, carrying with it an immense quantity of ice.

More Animals Killed.

On this day, I observed a number of deer at the head of the harbour; the second officer and four men pursued them, but were not able to get near them, for the animals were now beginning to know that it was not safe to be near men; they accordingly kept at a distance or fled entirely. On October 25, Sunday, there was a light wind from the north and the thermometer registered zero. After religious service, two bears were reported in sight by the second officer, on Hearne point, but owing to the day no hunting was permitted and the bears were left unmolested.

The shortening days prevented hunting and prolonged observations at a distance; and much time was now given on board to the study of works on Arctic exploration. The officers and men were encouraged to read about former expeditions, and acquaint themselves with the experiences of the men of other vessels in facing danger, in view of some unexpected occurrence.

In the narrative of Commander Sverdrup of the *Fram*, accounts are given of the number of musk oxen killed and used for food, showing that Ellesmere land also abounds in large game. So far we had been successful in hunting. On Friday, October 30, an addition was made to our store by the killing of eight deer, which were shot about the distance of one mile from the head of the ship. Quartermaster Lessard and myself went out to secure them, and accomplish it in one hour; their weight totalled when dressed, 600 pounds; an igloo was built and the meat put in for safe keeping in case of need.

Up to the end of October, we had killed 51 deer, 28 musk oxen, 2 large seals, 17 ducks and loons, 2 ptarmigan, 2 hares, 4 birds and 1 bear, weighing altogether about 14,000 pounds. Only about 10 foxes had fallen victims to our traps, showing that these animals had used on Melville island the cunning which characterizes them elsewhere. The bear trap which had been set, was tried by one of these Arctic giants, but was not strong enough to hold the immense pull of bruin, and he escaped.

In connection with securing game, I decided to give prizes to those who had acquired the greatest skill. Eight prizes were



Quartermaster Chassé. Horns of Deer in the Velvet.

given: the first was awarded Quartermaster Joseph Lessard, a pair of high moccasins; the second to Quartermaster Napoleon Chassé, a pair of moccasins also; the third to Mr. Frank Hennessey, one pair of high moccasins; the fourth to Reuben Pike, also a pair of moccasins; the fifth to Alphe Bouchard, a pipe with cover; the sixth to Joseph Goulett, also a pipe with cover; the seventh to A. Begin, cook, one muffler; the eighth to Joseph Thibault, steward, one box of cigars. At the close of the presentation of prizes a vote of thanks was given Mr. W. E. Jackson, Magnetic Observer, Mr. McMillan, Geologist, and Second Officer Morin and Third Officer Green, for their assistance in guiding the hunters and bringing in the game.

We had started a new industry on board by making deerskin sleeping bags for the expeditions, which we contemplated undertaking along the coast and to Banks island and Victoria land. The ship's officers and men were furnished with furs according to their size, and were well satisfied.

All hands were set to work to carry fresh water ice to the ship, which was melted according as it was required, giving us a supply of forty gallons of water a day from the tanks. On this day, the 30th, we landed 2,000 pounds of bread, coffee and tea and placed them in an igloo. At this time of the year it is dark at 3 p.m.; the men were given work as much as possible on board, but the evenings were long and the men were thrown upon their resources, assisted by the officers, for diversion. I disposed of a gramophone and 119 records, which was placed in the middle of the ship, so that music could be heard at both ends of the vessel.

The month of October was much colder than September, but the banking of the ship with snow, which had taken much of our time, enabled us to spend the nights on board in a more comfortable manner than if we had neglected this means of keeping out Jack Frost, the monarch of the north.

November 1 was observed as a holiday; the men were given liberty to go ashore to engage in amusements, but no success was met with in hunting. The thermometer registered 12 below zero on November 4, and there was great necessity for hurrying the work of embankment. The snow was drawn from a distance on sledges, as all that had been lying close by had been

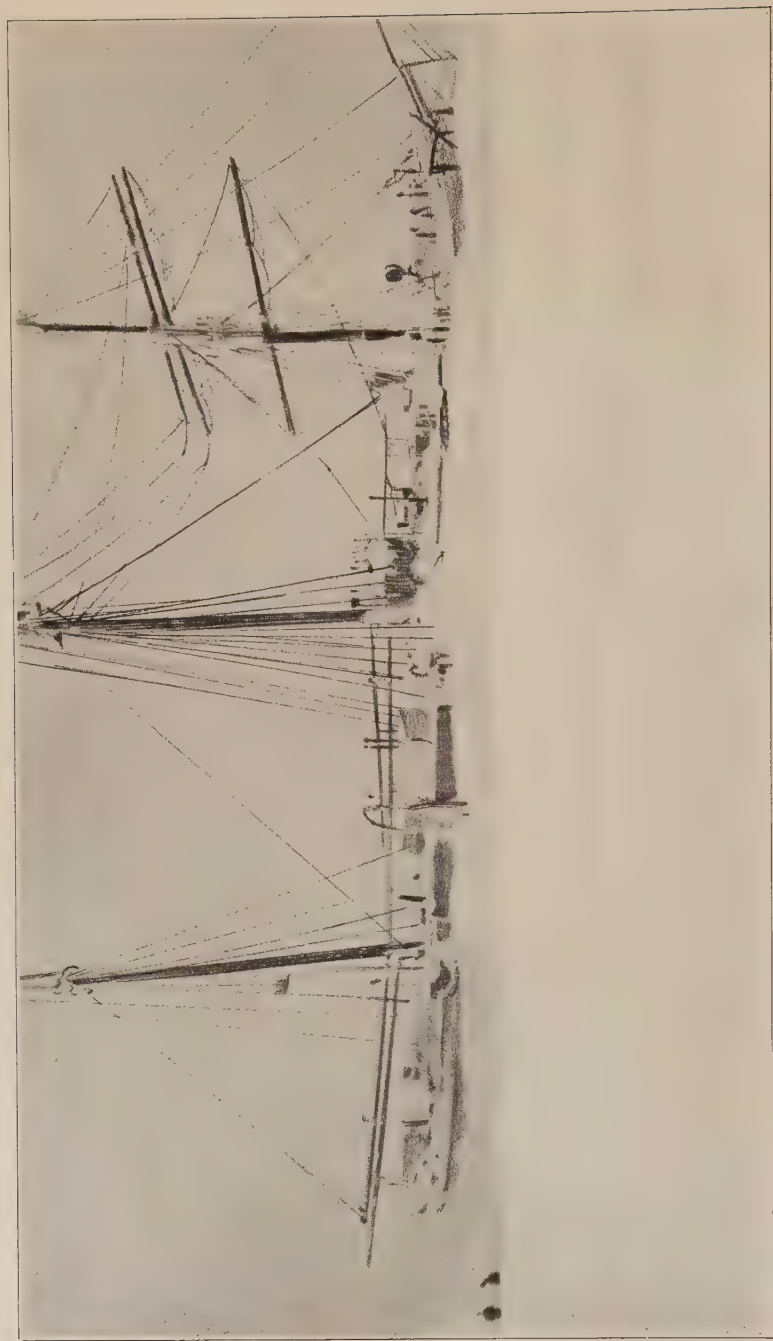
used. November 5 was a remarkable day, from the fact that the sun set for the last time for the season. On this day, the flag that had been set on the hill was unfurled so that it would be flying on the ninth anniversary of the King's birthday.

Temperature.

It should be registered, that there was more moisture in the air at Winter harbour, in the first week of November, than at Cape Fullerton and Ponds inlet, where the *Arctic* had wintered in two former years. I am, therefore, of the opinion that there was still open water to the north of Melville island.

The snow banking was finished about this time, and the *Arctic* resembled in appearance a man-of-war, with her white mantle of snow. No cold could enter her sides with nearly 250 tons' measurement of snow. The deck had been covered from stem to stern with inch and a half tongued and grooved first-class lumber, enabling us to work on deck secure from cold and wind. When the work had been completed, all the members of the ship's company went outside to view the white ship surrounded by virgin snow and ice in a white region. A photograph was taken, and the view is included in the illustrations of this report.

While the temperature outside was 40 below, on the main deck it was only 25 below zero, and the temperature in the living quarters varying from 55 to 65. Under deck the galley stove warmed about three parts of the ship; a small stove forward warmed the other part. The engine-room and fire-room were heated by another small stove to 60 above zero. In order to keep the temperature required for comfort, we used about 1,700 pounds of coal per week. With this consumption of coal it was possible to keep the vessel warmer, the passage of 43 people through the doorways assisted in keeping good ventilation but reduced the warmth. The proper ventilation was secured by a fresh air pipe passing down forward and an upward pipe aft to carry off foul air. The ship's head was as usual placed to the north, from which the prevailing winds came, being principally north and northwest winds, but they seldom came from the south.



The "Arctic" buried in snow in Winter Harbour.



"Arctic" in Winter Harbour, Melville Island, on the King's Birthday, 1908.

Celebration of King's Birthday.

A light fall of snow on Sunday, November 8, was sufficient to cover every part of the land with a mantle, and we now had no further speculation in our minds about the setting in of winter. The moon was full on this day and did not set. November 9 being the anniversary of the birth of His Majesty King Edward the VII, we were pleased to manifest our loyalty in an appropriate manner. All our flags were waving in the breeze on our little vessel as if she had been in port in the south. We were not favoured with sunlight to give the best effect to the variety of colour displayed from our rigging, but the light from the full moon, with her more highly burnished face than is seen in the south, and reigning throughout the day, furnished sufficient light to distinguish the colours. It is true the effect was somewhat weird, but under the flying colours we fired the customary salute, at noon, of 21 shots from our rifles, not having on board a big gun. Nearly ninety years ago, the brave and courageous Parry had named the islands which he discovered where we were sojourning in honour of a former British King, and on the 9th of November, 1908, we felt the same sentiment towards the present King, who so acceptably wields the sceptre over not merely a kingdom, but an empire, enlarged by discovery in all parts of the world. The day was observed as a holiday, and the ship's company enjoyed some few luxuries which did not form the usual every day fare on board; the health, also, of the King was drunk by all on board, with the proper ceremonies.

The day was made extremely interesting by the appearance of a large bear alongside the ship. He was met with the unexpected salute of five shots, which did not kill him, but left him so badly wounded and in such a position that we were able to take a photograph of him alive. Two additional rifle shots after the operations of the camera brought Mr. bear's venture-some curiosity to an end.

Construction of Snow Observatory.

On November 10, work was resumed; part of it consisted of building an observatory for meteorological observations, and an igloo for experiments in testing oil as fuel for cooking.

Experiments with Sleigh Runners.

During the days immediately following, we made several tests of the power required to draw 750 pounds' weight on the snow with large sleighs shod with bone and steel and sleighs without shoeing. The *Arctic* sleigh weighed 145 pounds, designed on board our ship, with heavy runners, shod with bone; pulled by the steelyards 100 pounds; the *Investigator* design, bone shod, pulled 125 pounds; the *Resolute* type of sleigh, steel shod, pulled 140 pounds. A small hand sleigh weighing 46 pounds was tried; it was bone shod, and loaded with 200 pounds' weight, and pulled 46 pounds. These tests were made in a temperature of 15 degrees below zero; the dry snow, as may be supposed in this temperature, caused the resistance against the draught to be much greater than a higher temperature. Another test was made by icing the shoeing, which had the effect of causing the draught to be less; the pull of the *Arctic* sleigh was then 60 pounds, that of the *Investigator* sleigh 50 pounds, and the steel shod *Resolute* sleigh 75 pounds; the runners of this sleigh were broader than the others; the hand sleigh iced, pulled 46 pounds.

The short heavy sleigh built upon lines procured from the Eskimo, pulled easier than the others at a temperature lower than 15 degrees below zero. Subsequently it was found for spring work, when the ice and snow were melting, that the steel shod sleigh was the easiest running sleigh.

Sails were made for each sleigh, and each one was tried under winds of greater and less velocity. The tests with the sails showed that the pressure of wind assisted in the movements of the sleighs, according to the square foot of canvas and velocity of the wind.

Whilst the testing of sleighs was proceeding, the endurance of the men was noticed, and classified according to merit in the following order, viz.: O. J. Morin, second officer; C. W. Green, third officer; Napoleon Chassé, quartermaster; Reuben Pike, waiter; William Doyle, A.B.; Thomas Olden, A.B.; Louis Wistle, A.B.; Daniel Lane, A.B.; Joseph Goulet, waiter; Joseph Lessard, quartermaster; Alphe Bouchard, A.B.; George LeBel, A.B.; Joseph Tremblay, A.B.; Joseph Bodi-



Sleighs used in trip to Banks Island.

ker, A.B. These men travelled the farthest and required less attention.

Snow fell each day and the temperature was falling rapidly; the days were becoming darker as the sun's light was declining, but the moon shone all day long.

On Sunday, November 15, the wind blew at the rate of 48 miles an hour from the northwest, and the thermometer registered 23 degrees below zero. Religious service was held this day, in the saloon, but no one attempted to go outside the ship as on previous Sundays to engage in walking, consequently the day was considered the longest day on board up to that time. The high wind had blown away part of the snow bank along the ship's sides, and on Monday we repaired the loss around the ship and observatory igloo.

Up to this date we had used ice from which to obtain our supply of water, but now found snow at a more convenient distance. The snow did not furnish water so free from foreign material as the ice. The wind had caused sand and other detritus to mix with the snow throughout, while with ice the sand settled to the bottom. All water was examined before use. The mixture of sand with the snow made the drawing of sleighs far more difficult.

The record box taken from Dealy island containing Captain Kellet's documents were taken out and placed to dry. They had not been opened in their wet and frozen state, and it was necessary to dry them thoroughly before attempting to examine them owing to their frail state. They had originally been placed in a cache by Commander Kellet, who abandoned in these waters his ship *Resolute*.

November 20 was a rather cold day; the thermometer showed 25 degrees below zero; the wind was blowing at 25 miles an hour, but as the snow was hard and not drifting, we cut a quantity in blocks and piled them for future use to melt for drinking water.

This day, the moon was in conjunction with Venus, and most of the stars of the first degree were visible at noon. The officers were continuing their records of the tides.

November 22 being the feast of St. Cecile, the patron saint of singers and musicians, we commemorated the day and

varied the monotony with vocal and instrumental music. There were some excellent singers and musicians on board, and these entertained the ship's people in a manner greatly enjoyed by all on board.

We measured the distance from the ship to Parry's rock, and found it to be a little over 5,000 feet. The snow was drifting now, and the temperature remained at 25 below zero. The red glow in the sky at noon gave us promise of a sunrise, and from custom in a moment's forgetfulness, we naturally thought of daylight, but we were soon reminded that the sight of the sun was only for lower latitudes at that time of the year. We had, however, sufficient light from the red glow to read at noon outside of the ship for a short time.

The forward store room was converted into a working room for making and repairing clothes, sleeping bags and foot wear. On November 28, it blew a strong gale of 60 miles an hour from the north-northwest. We at this time used snow water for drinking, and found it more palatable than ice water, having less salt than the ice.

On this day, the ice was measured; it was 34 inches in thickness, with a good deal of snow upon it. The snow at Winter harbour was deeper than at Ponds inlet, giving stronger proof of more moisture, and consequently more open water northwest of Melville and Prince Patrick islands. The wind had increased in velocity from 60 to 70 miles an hour on Sunday, the 29th, drifting the snow into depressions and sweeping it from the hills and wearing it away from our embankment around the ship and from our igloos. The following days were employed in repairing the damage to the ship's embankment and observatory igloos.

It was remarked that the animals were not so frequently seen, but some foxes were taken in the traps. The weather moderated, enabling us, on December 4, to take an outing for a few hours; the enjoyment of the exercise was heightened extremely by discovering five foxes in the traps. There was great rivalry among the men, and considerable ambition shown with regard to success in the trapping, and all did their utmost in tramping to the points where they had set their traps. I looked upon the encouragement of trapping as more beneficial

than enforced movements with no particular reward or object in view beyond the maintenance of good health. Valuable as health is to all, yet some of the men in an expedition of this kind are loth to exercise themselves in the higher latitudes unless they have the stimulus of good fortune, even if the article secured is of small intrinsic value. During the evening of this day, a lone wolf appeared near the vessel, and one of the quartermasters and myself stayed between two and three hours with the hope of shooting him, but we could not remain still in the cold any greater length of time.

An inspection was made of the sleeping and living quarters of the officers and men, on December 5, by the doctor and myself. We noticed that three bunks in the forecastle and one bunk in the after forecastle were damp. This is a serious matter, and a remedy was applied by protecting the bunks from the draft which came from the door when unclosed.

Mr. Vanasse, Dr. Boldue and myself walked to Parry's rock, but we had not light enough to read the inscription; although there was a red bank in the sky, there was no daylight from it.

Sunday, December 8, service was well attended, but our walk in the afternoon was confined to circling the vessel in one beaten path. December 11 was an extremely cold day; a strong breeze came from the north and the cold was 43 below zero. At 11 a.m., Mr. Jackson and I walked two miles with our heavy fur clothing, and no discomfort was felt. When men are properly fed and clothed the temperature does not prevent work. The ice at this time was 43 inches thick, and the snow from 5 to 6 feet deep alongside the ship.

December 12 was a fine calm day; a yellowish red tinge in the sky to the south reminded me that the sun was shining clear in some lower latitudes. One lonely cloud was visible bearing about southeast from the ship. As the sun did not extend his rule to our latitude, we were compelled to make the best of a reign of darkness, and sallied forth in our daily exercise some little distance from the ship. An incident occurred on this walk which is worth narrating. We had on the ship two dogs, one named Arctic and the other Tom; Arctic had been raised on board and was the general favourite, and had privileges

which Tom did not have. Tom showed that he bore Arctic a grudge because of the attention and petting the latter had received, and attacked him; Arctic, on his side, decided to be master even if he had to fight, and showed he was quite able to hold his own against Tom. We afterwards separated the dogs on board the ship, by putting one forward and the other aft. The feeling of jealousy on the part of Tom was not again shown, due, I believe, to the fact that he did not witness the usual petting of Arctic.

The temperature remained around 40 below zero, but this did not prevent our walks. We now found the walking better on the bay ice than on the land, due to the snow being soft on land while it was hard upon the ice. Our journey extended to the boats; the men in the meantime were kept at work on board at various kinds of work. Inspection of the beds again took place, with the result, that some men were ordered to take their beds to the engine-room stokehold for drying. At noon on December 16, the weather was beautiful and fine. A small yellowish red line appeared toward the south. The quarter moon was shining all day but at night, it was quite dark. We all enjoyed a walk after dinner in 40 below zero, during which we saw traces of deer and wolves.

Deer and Musk Oxen do not Migrate.

Traces of deer and wolves were seen by us to-day, some distance from the coast. It has been stated that the animals of the Northern Archipelago migrate, but there was sufficient proof for the belief that the animals do not leave Melville island. During our travels 60 miles west, 40 miles east and 50 miles north, there were no traces of animals on the ice, with the exception of bears, wolves and foxes, and they only go as far as tidal cracks. Foxes, however, follow bears when they fish for seals in places where water is visible at this time of the year. Some wolves were seen by Mr. McMillan, and about twenty of them were howling on shore. The weather at this time was varying from 34 to 36 below zero, and at times the wind during the night blew about 40 miles an hour. With weather of this kind, even the possible chance of killing a few wolves could not entice us outside; if it were calm we could

have endured it without discomfort, but when the wind blows at the rate of 40 miles an hour, human beings are in danger of loss of life. It is, however, a consolation to know that a house can be built in an hour, of frozen snow blocks, resembling marble in appearance.

Christmas in the Arctic Regions.

Approaching Christmas our attention was divided between the ordinary work and preparations for the 25th. The ice was measured, and found to be 42 inches thick. As far as we could see the ice was level, showing that no pressure had taken place within the bay. The first tidal crack was about 5 miles away in a southeast direction. On the 22nd, the shortest day of the year, we could only see a reddish yellow tinge in the south-southwest, but total darkness reigned from the east to the north and from the north to the west; cold was felt; the thermometer registered 40 below zero on the 22nd. Jack Frost was letting us feel that he controlled those northern regions, and imprisoned us within our ship. Notwithstanding such intense cold, we decorated the saloon and men's quarters with flags; the large photograph of the Minister of Marine and Fisheries in our possession was hung upon the mainmast, and preparations were made for giving Christmas presents. On the night of the 24th, the midnight service was held, lasting one and a half hours, and during the service the gospel was read.

At 8 o'clock Christmas morning, the men entered the saloon and wished myself and the officers a Merry Christmas, to which I responded in the usual way by furnishing refreshments and some remarks upon the importance of our acts in proclaiming the territory and waters, Canadian.

Menu cards for our Christmas cheer were decorated by Mr. Frank Hennessey, whose sketches of various portions of land and water form part of the illustrations of this report.

From the 26th to the end of December, the officers were preparing their reports. Mr. Braithwaite, the mate, was kept constantly at tidal work, and on occasional days of each month measured the thickness of the ice and reported up to the end of the year.

Observations of the ice movements and formation in McClure strait were made during August, September, October and November. As a result of these observations, I came to the conclusion that McClure strait is open for navigation from the middle of August to the end of September; after that time it is possible to navigate the strait until October 15, but dangerous. There can, however, be no doubt about the strait being the Northwest passage from the Atlantic to the Pacific. Subsequently an expedition was sent west from the *Arctic* in charge of the chief engineer; it was ascertained that the climate improves very much going westward, and animals are more numerous.

The last week of December was extremely cold at Winter harbour; the temperature on the 27th and 28th was 50 degrees and 53 degrees below zero, and on the 29th, 55 degrees below. This was the coldest day experienced by us on the voyage. Notwithstanding this extreme cold, Doctor Bolduc and I were outside the ship for one hour; there was no wind, and being clothed in deerskins, we did not suffer from the cold.

The doctor examined every person on board from the commander downwards, and his report indicated that the health of all on board was good.

The last day of the year was quite a busy day. The doctor, chief engineer, mate and steward reported to me, and I completed my own report for the transactions on board from the commencement of the voyage to the end of the year.

A list of the ship's provisions on board was prepared, showing that we had provisions for eighteen months, to which should be added 14,000 pounds of fresh meat secured by hunting, and coal for another year.

Navigation from the Atlantic to the Pacific.

In regard to the Northwest passage, which received so much attention from early navigators and which they displayed so much anxiety to find and safely navigate, I here express my opinion, based upon observation so far as I have gone, and from information received from whalers who had come from the Pacific. I have not any doubt that with modern ships and the aid of charts and other information published, that the North-

west passage can be made without much risk. The discovery of the passage by Commander Rould Admusson, along the coast of the mainland, is not practicable for merchant ships of size on account of the shallow water in Dease and Simpson straits, and the ice jams in Victoria strait in which Sir John Franklin's ships were caught.

The safest and best passage from the Atlantic to the Pacific, is by Davis strait along Greenland, as far north as Cape York, crossing Davis strait in northern waters, coming south then to Lancaster sound along North Devon, keeping North Devon islands close on board all the time until Erebus bay is passed, then crossing the Wellington channel to Cape Hotham on Cornwallis island, keeping it near until Griffith island is reached. On no account should that island be left out of sight in passing; vessels should pass to the north if possible, as the ice is always kept in motion by the tide; then cross MacDougald's channel well to the north. Bathurst island should be within 3 miles all the time of passing along its coast. Baker island will appear dark if no snow has fallen on it, but a snow squall will change its appearance to resemble a large mass of floating ice. Moore island under the same conditions will appear exactly like Baker island; mariners should, therefore, guard against being deceived after a snowfall. This part of the coast of Bathurst island shows shallow water as far as Cape Cockburn. The direction should be continued across Austin channel to Byam Martin island, keeping along the coast of Melville island into McClure strait, and then proceeding until Cape Wrottesley is passed, then steering along the coast of Banks island into Beaufort sea along Mackenzie bay, then along the coast of Alaska to Behring strait. A vessel should be through the passage and on the Pacific side before the 10th of October.

Depots Available.

Three depots with provisions are available for shipwrecked crews: one small depot on Whaler point, Port Leopold; one at Erebus bay, and a large depot at Dealy island. The resources of Melville island are considerable.

List of Documents found by 'Arctic' Expedition.

No. 1. Description of house called Sailor's Home, built by Captain Kellett on Dealy island.

No. 2. List of provisions, stores, &c., landed on Prince Royal island by Robert McClure, commander.

No. 3. Copy of notices left on Prince Royal island by the same commander.

No. 4. List of provisions landed at Dealy island by H.M.S. *Resolute* for the relief of distressed parties visiting it, dated July 21, 1853.

No. 5. Table showing the mean height of barometer with temperature of the air on board H.M.S. *Investigator* from August, 1850, to March, 1853.

No. 6. Letter of instructions from Captain Henry Kellet to survey the ship *Investigator* in the Bay of Mercy, Banksland, with three letters relating to the abandonment of the *Investigator*.

No. 7. Document relating to the abandonment of the *Resolute*, including list of stores belonging to the *Resolute*.

No. 8. List of articles deposited on the north side of Melville island on July 14, lat. $75^{\circ} 20'$, N. long. $109^{\circ} 40'$ W., by Commander McClintock.

No. 9. Document dated on board H.M.S. *Resolute*, August 17, 1853, giving information where records will be found in which it is stated that there was no sign of the vessels of Sir John Franklin.

No. 10. List of medicine left by William Dunville, surgeon of the *Resolute*.

No. 11. Admiralty orders given to Commander Maguire, of H.M.S. *Plover*, Moore harbour, Point Barrow, sent by W. A. B. Hamilton by command of the Admiralty.

No. 12. Record left by Lieut. Mecham, giving account of records found by him in charge of a party belonging to the *Resolute*, who went to ascertain if traces could be found of Captain Collinson.

No. 13. An Eskimo and English vocabulary.

No. 14. Part of a pamphlet describing the Eskimo.

No. 15. Twelve letters addressed to Captain Collison, his officers and men, who were on board H.M.S. *Erebus* and *Terror* of Sir John Franklin's expedition.

I discovered two parchment documents on our arrival at Melville island, one on Table hill and one on Northeast hill,

left by Commander William Edward Parry in his trip of 1819-20. One was a copy of the other, and they contained a record of the discovery of nine islands, which he named New Georgia in honour of King George the Third. The discovery of these islands has been already referred to in this report, but I may here state, that Commander Parry changed the name to the Georgian islands in his published report, owing to the fact that on his return to England, he learned that territory in the southern hemisphere had been discovered and named New Georgia, and that King George the Third was dead. Another parchment record was discovered during the sojourn of our company on Melville island on August, 1909. The document bore the date of August 1, 1853, Dealy island, relating to the wintering of the *Resolute* and *Intrepid*. Dealy island was named by Parry after Mr. Dealy, head carpenter on board the *Hecla*. Other discoveries of our expedition were a document left by Lieutenant Meham on Dealy island, 1854; a document stating where full information will be found concerning movements of the *Resolute* and *Intrepid*; record left by Lieutenant McClintock on June 6, 1851, opened by Robert McClure on April 28, 1854. There was also discovered by us notice of the erection of a cairn by Commander Kellet and Commander McClintock, who wintered at Dealy island; document written by A. B. Bradford at Point Cockburn, returning from Melville island, probably of the *Intrepid*; Cape Cockburn was named by Parry after Vice Admiral Sir George Cockburn; notice of provisions deposited by a party under McClintock, May 25, 1851; notice of deposit of stores left by William May on May 11, 1851, and notice of deposit of stores left by McClintock on April 29, 1851.

We discovered the documents left in recent years relating to stores sent by the Norwegian Government in 1904, and landed on Whale point, Port Leopold, where the stores of Rauld Amunsson are still lying; also document belonging to Commander Otto Sverdrup, dated March 18, 1902, with a map of Jones sound, found on Cone island, Jones sound. In addition to these documents, coins and other relics were found, some of which are enumerated in a list following.

Undersøgning

fra 2^{den} norske polarexpedition med "Fram".

for en til Jones sund muligvis kommende eftersøgningsexpedition.

Da jeg ikke kan høre fra muligheden af, at et fartøj til kommende sommer vil bli udsendt til disse farvande for at søge efter "Fram", nedlægges nedlagt kartskitse over Jones sund, hvorpå vor vinterkvarter er udført.

— Som det af nævnte skitse fremgår, er "Fram" ankommet i Læsefjorden, hvortil vi kom 17^{de} september 1900. På grund af overordentlig streng vinter og ugunstige sommer, er vi endnu ikke op i fjorden 1901, da det var min agt at gå hjem. Trods alle anstængelser lykkedes det ikke at komme ud fjorden, og arbejdet måtte opgives 6^{te} september. Vi var da kommet ca 10 kvartaler fra fjordmunden, og vi havde da ca 5 kvartaler igennem til åbent vand. "Fram" kan altså fra fester kanten enten ved at gå overland på østre side af fjorden eller på isen.

Minne undersøgning vil bli udført på følgende steder:

1. Cable Island
2. Små øer og østaf fjordens mund
3. Fjord
4. Læsefjorden
5. Storviken
6. St. Helene
7. Vindmølle

Forholdene her i de år, vi har været ^{her, ved det gamle} Jones
sund, fra midten af juli til udgangen af
september har hvidtissensbetet skib kunnet beføre
sundet.

Efter vor erfaring findes mest is øst
for Hornsøfjorden, men end det i sundets vestre del
er praktisk balt, isfrit.

På Skredningen øst for
Hornsøfjorden bør styres med forsigtighed, da der
er mindre is.

Vår proviantforsyning er rig-
elig og god, så vi befinder os alle vel.

Vi har gået så langt som
nu borte til det nye med "Fram".

Fram, Gaisøfjorden den 18^{te} marts 1902.

76° 39' n. br.

88° 59' v. lg. F. G.

O. K. Nordrup

CHAPTER V.

Celebration of New Year's Day, 1909.

January 1, 1909. The year came in with a strong wind from the north, and the temperature was 53 below zero. I held a reception; the ship's company came into the saloon to wish me the compliments of the season, and at 11 a.m., religious service was held, at which there was a good attendance.

An illuminated menu card had been prepared, and dinner was served at 3 p.m. The monotony and round of duties incidental to our position in Winter harbour, during the period of darkness, was varied on this occasion by a semblance of the universal festivities of New Year's day. A few toasts were drunk, consisting of drinking to the health of Sir Wilfrid Laurier, the Premier of Canada; to the Minister of Marine and Fisheries, and to our friends at home. Several speeches were made, and as a number of Newfoundlanders were on board, I expressed the opinion that from our point of view, the entrance of Newfoundland into a union with Canada would be mutually beneficial. It would round out the Dominion, and at the same time bring the Labrador coast, now devoid of aids to navigation, under the Canadian lighthouse and buoy system, and benefit navigation for all vessels seeking trade in northern waters. It was stated that Canada is now attracting immigrants from European countries and the United States, owing to what she has to offer, and on account of the strides she is making in material prosperity, that Newfoundland being in close proximity, would be the largest sharer in the benefits arising from the establishment of aids to navigation along the coast of Labrador and Ungava, which will be part of the province of Quebec. It was urged, from a practical point of view, that the fishing trade would receive an impetus from the demand for her fish products, and more particularly help Labrador, a district now utterly neglected.

January 2 was cold; the temperature 43 degrees below zero; the ice measured at the time, 51 inches in thickness. On

this day the doctor and I again inspected the ship, and he examined the men. His report upon the health and condition of each one on board was submitted to me, and is now an appendix to this report.

My attention was called to-day, by the chief steward, to the unnecessary consumption of illuminating oil. This matter was regulated by issuing orders forbidding the burning of oil when the men were not in their rooms. On Sunday, January 3, religious service was held, and we were specially favoured with good singing and a larger attendance than usual of the crew. The choir consisted of Dr. J. A. Bolduc, Mr. E. Bolduc, second engineer, Joseph Leclair, Joseph Tremblay and J. Goulet.

Taking the Bearing of the Moon.

In preparation for the expeditions which it was our intention to make to Banks island and Victoria island, we began taking the bearings of the moon every twenty minutes each day and night of the month, and a table was made for guidance in travelling at night. This table was found of great service by the men who afterwards crossed the strait to the south, in their extremely arduous trips to the lands mentioned. For these journeys the officers were engaged in making sleeping bags and other preparations. Some of the officers and the staff were making tidal observations.

We had two cows, taken on board at Quebec, to furnish milk, but I found the experiment was not satisfactory, as the return did not pay for the original expenditure for food. They consumed in 5 months 13 days, 42 bales of hay and 30 bags of cornmeal and other grain, yielding milk to the value of \$100. They were killed at this time, and weighed 671 pounds dressed. Had ponies been taken on board instead of cattle they would have been much less troublesome, and would have been very serviceable for drawing sledges, conveying supplies to cairns and depots and in fall travelling, in search of natural history specimens and in geological explorations.

In the following days, we had strong gales, the wind blowing from the north at the rate of 72 miles an hour with heavy snowdrift, which filled our igloos and broke one of our sledge masts by its force. On the 9th, however, it was practically

calm; we examined the position of our ship, and found that she had not moved in her cradle but was frozen quite fast.

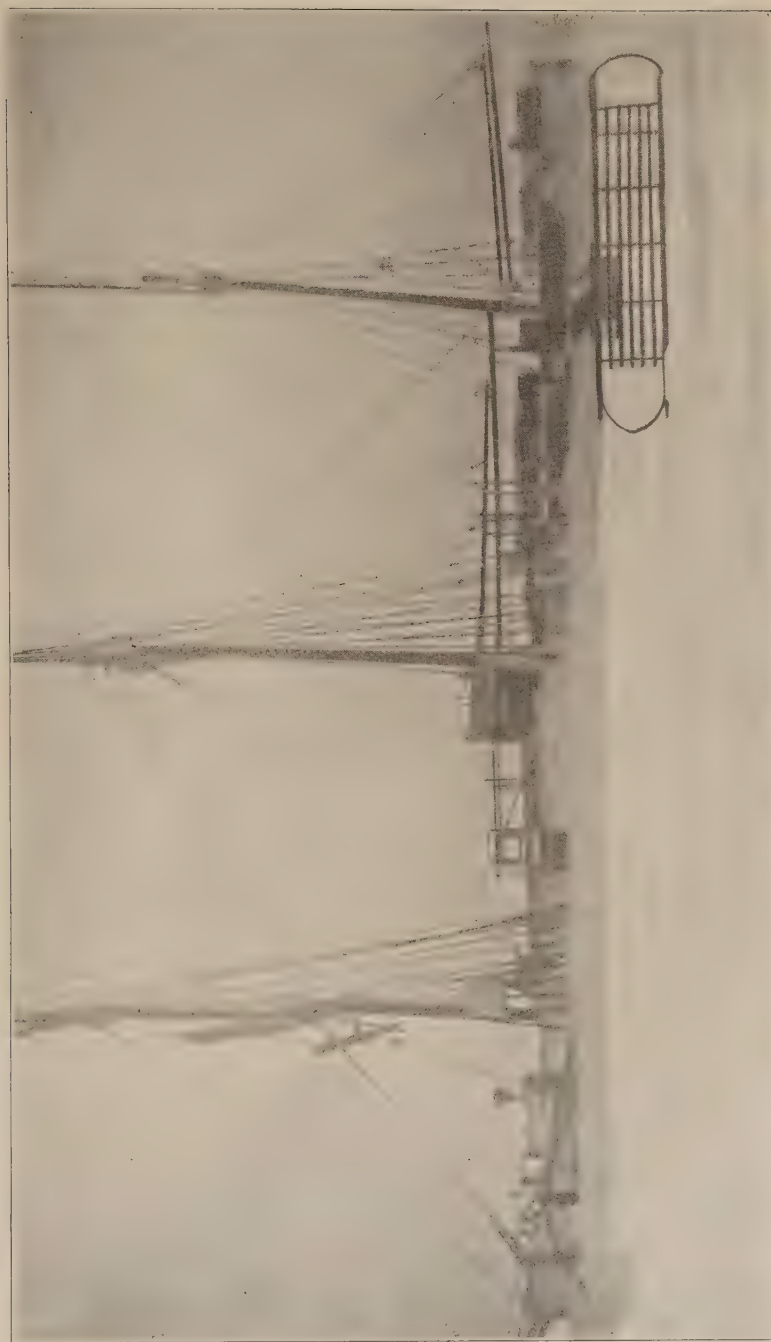
Return of the Sun.

On January 12, at noon, a reddish sign of the rising sun was visible. Tracks of deer were reported abreast of the ship, by Mr. Vanasse, which confirms the belief that animals do not migrate from Melville island during winter. The weather continued cold, ranging from 25 to 51 below zero, and with high winds, rendering it altogether too severe for outside operations, consequently, we occupied the time on board by inspection of the forecastle, all the living quarters, the store room, mess room, galley, lower and upper deck, and the ice used to supply drinking water. The cooking utensils were inspected twice a week and the bed clothing once a week; the latter, if damp, was taken below to dry. The officers and doctor were required to report to me weekly, in order to keep up proper sanitary conditions. The crew had an opportunity to make complaints to me, if any cause arose, and suggestions for improvements were considered. Outside exercise was also insisted upon, but it was the hardest part of the discipline to enforce owing to the aversion of the men to exposing themselves to extreme cold. In addition to the exercise in the open air, the men were employed in hauling fresh water ice for melting for a supply of drinking water.

On January 25, the tide reached its highest mark, being 4 feet 3 inches. At this time, I took soundings with Quartermaster Lessard, and we had 6 and 8 fathoms. While performing this work, we killed a hare, which weighed 9 pounds.

Stores left by the 'Resolute.'

On the 27th and 28th, the cold was 45 and 48 below zero. Quartermaster Lessard and two men were sent to Fife point, to bring to the ship some stores left by the *Resolute*, for examination. Four barrels of provisions were secured, but these stores had been so badly damaged by weather and the bears, that they were unfit for any purpose, and I deemed it proper to condemn them. I built a cairn at the place where the stores



Dominion Steamer "Aretic" buried in snow. Taken on return of daylight in 1909.

were taken from, 11 feet high, and deposited records with directions in case of shipwreck overtaking any vessel.

The remainder of the month of January was cold, but the snow was firm, permitting travelling, and although some tramps were made, they were not to any great distance from the vessel. If it had been possible to secure dogs, long journeys could have been made and our explorations might have been extensive and more satisfactory.

The first of February entered with high wind, which increased to a gale at midday, with snowdrift and the temperature 25 below zero. Snow around the ship was 5 feet deep. Daylight was now approaching, and February 3 was a red letter day for us. With Mr. Frank Hennessey, I went out to the top of West mountain to catch a view of the sun. A few minutes before twelve, we saw the rim, and at noon about one-third of the orb was visible. The sight was inspiring, and the pleasurable anticipation of again feeling the warmth of old Sol and viewing objects again by the light of his rays after three months of cold and darkness, can be felt but cannot be adequately described. It was truly a glorious sight from the mountain, and made greater by refraction. On board ship at the same hour a similar view was obtained from the masthead. We had, at this period, about three hours' daylight, which not only changed the appearance of our surroundings, but also the countenances of our people on board, who became far more agreeable to look upon. The darkness of three months seems to influence the lives of men and cause depression, which affects the body and mind. The only remedy for this state of things is outside exercise and daylight.

Music, amusements and reading, had a most beneficial effect upon the ship's company, especially music. I am of the opinion that music for every hour, when the men were not employed in their work, would dissipate the gloom and monotony felt during the dark season. In outdoor exercise, the men were encouraged to hunt for the purpose of securing fresh meat and for the benefit derived from the excitement of the chase as well as from the physical exercise.

During the early part of February, the men were employed on board making and repairing sailor clothing. On the 9th of

the month, we had the strongest gale of the cruise; for a few minutes it blew 100 miles an hour, for one hour it blew 94 miles, and the rest of the day 84 miles an hour. Everyone on board was forbidden permission to go outside, and the fires were withdrawn from the stoves, excepting the galley stoves, as they smoked too much for comfort. The snow was swept from the hills and the aspect of the country quite changed. The effect was noticeable upon the ice where the snow was blown from the smooth fields of ice to the leeward of the hummocks. The temperature during the gale was 30 degrees below zero, but when the wind moderated on the 11th, the weather became warmer, registering only 13 below zero, with the sun shining brightly from 11 o'clock until 1 p.m.

Preparing for Trips to Banks island.

An ice box had been made on board by myself and the carpenter, into which we now placed 3,200 pounds of musk ox and deer meat for reserve. On February 12, one small and two ordinary sized deer were killed, two of them weighing 172 pounds. Their skins were used for making sleeping bags for travelling across McClure strait to Banks island. Oil stoves were also made on board under the direction of the chief engineer, who showed remarkable ingenuity in devising oil stoves, utensils and other arrangements for cooking for four different parties. Sledges were made, one with sounding gear and a reel with 1,610 fathoms of line. Three watches were set to have them rated by the chronometer before spring to be used in travelling.

Watches Presented to the Arctic Expedition.

I desire to express my sincere thanks to Mr. A. Wittnauer, Montreal, for the presentation of four watches, which have been used during the three expeditions of the *Arctic*. With great pleasure, I acknowledge the generosity of the giver, and record the great value to us of the time keepers because of their accuracy. The dials are marked for 24 hours.

I also acknowledge the kindness of Messrs. Mason and Risch, who lent us a fine piano that furnished numerous hours of enjoyment. The officer on board who played the piano was able through its use to make the hours when the men were off

duty pass pleasantly, and relieve the depression which at times during the long winter hours settled upon the crew.

Trips to Hearne Point.

On February 15, three quartermasters and myself went to Hearne point, and took with us the two dogs of the ship; we saw four deer, but could not get near them. Hearne point was named by Parry after Samuel Hearne, an American traveller. The days were now growing longer rapidly; the sun rose on the 18th at 9.40 a.m., and shone until 2.20 p.m. On the 19th, the wind blew very strong from the prevailing quarter, northwest, and the temperature was 40 degrees below zero, compelling the crew to remain under cover, but the time was employed making sledges and a cross to be put on Northeast hill, to commemorate the annexing of the Arctic islands to the Dominion of Canada. On the 20th, the ice was measured, and found to be 77 inches thick. On this day, Mr. William E. Jackson placed a datum on Parry's rock for a tidal bench mark. The distance of the rock from the ship was measured by me with a pedometer, and found to be 5,094 feet; the top of the rock itself was 52 feet above sea level.

The men were at this stage employed in hauling stone ballast to the ship, which gave them training for the spring journeys and proved excellent exercise for the time being. Here, I think it appropriate to mention that we had on board amongst the seamen, three men who are experts in making and rigging ships' models, and they practiced their craft. The best workman and designer is John Anderson, a Norwegian.

The weather during the latter part of February was extremely cold, being about 40 degrees below zero, with strong winds blowing.

The 1st of March came in with disagreeable weather; the wind was from the southeast; on the 2nd, the weather improved, and good fortune met the efforts of Pike and Goulet, who killed two deer, weighing 90 pounds each, in their hunting trip from the ship.

Token of Annexing Arctic Archipelago.

On March 4, Mr. Jackson erected his tent for meteorological observations, and Mr. Green and I went with the cross,



Taking ballast on board "Arctic," Winter Harbour.

that had been made to commemorate the annexing of the Arctic archipelago to Canada, and erected it on Northeast hill, Winter harbour. Stones were piled around the cross to keep it in place. The day being exceptionally fine, we could see from the hill the blue hills bearing north-northwest by west across the Liddon gulf. Liddon gulf was named by Parry after Lieut. Liddon, who commanded the *Griper*.

Spring Work.

I had been busy taking the sun's bearings on the 74th and 75th parallels, for the use of the men on the expeditions intended to be made in April and May. I prepared also charts during the winter and all the data for spring.

The engineer was working at the oil stoves and putting petroleum in convenient packages. The men were employed in fixing fishing nets and repairing spring clothing for the sleigh expeditions. The doctor prepared directions for the men in case of sickness or accident, and also put up medicine for their use, if necessary. Two charts of McClure strait towards Banks island were copied. Instructions were written by me for the officers who took charge of the travelling parties; kodaks with a supply of films were amongst the fit-out; guns, ammunition, sleeping bags, compasses, provisions and stores were made ready. Three sleighs were loaded for the trips to Banks island and Victoria island.

Sleigh Expeditions to Banks Island.

On Tuesday, March 30, the parties were ready, and left the ship. One sleigh was in my charge, one in charge of O. J. Morin, second officer, and one in charge of Charles W. Green, third officer, who with Joseph Lessard, Napoleon Chassé and A. Vigneau, quartermasters, and 11 men, comprised the whole of the parties. The first day, we travelled 13 miles, and camped alongside of a large iceberg at Cape Phipps, 9 miles west of Hearne point. The following day, the appearance was threatening, and in the morning finding that our sleighs required altering, and that the packages of biscuit which had been opened were found unfit to send with a party on so perilous a journey as our men under Mr. Morin and Green were about to take, was sufficient reason for all the parties to return to the ship.

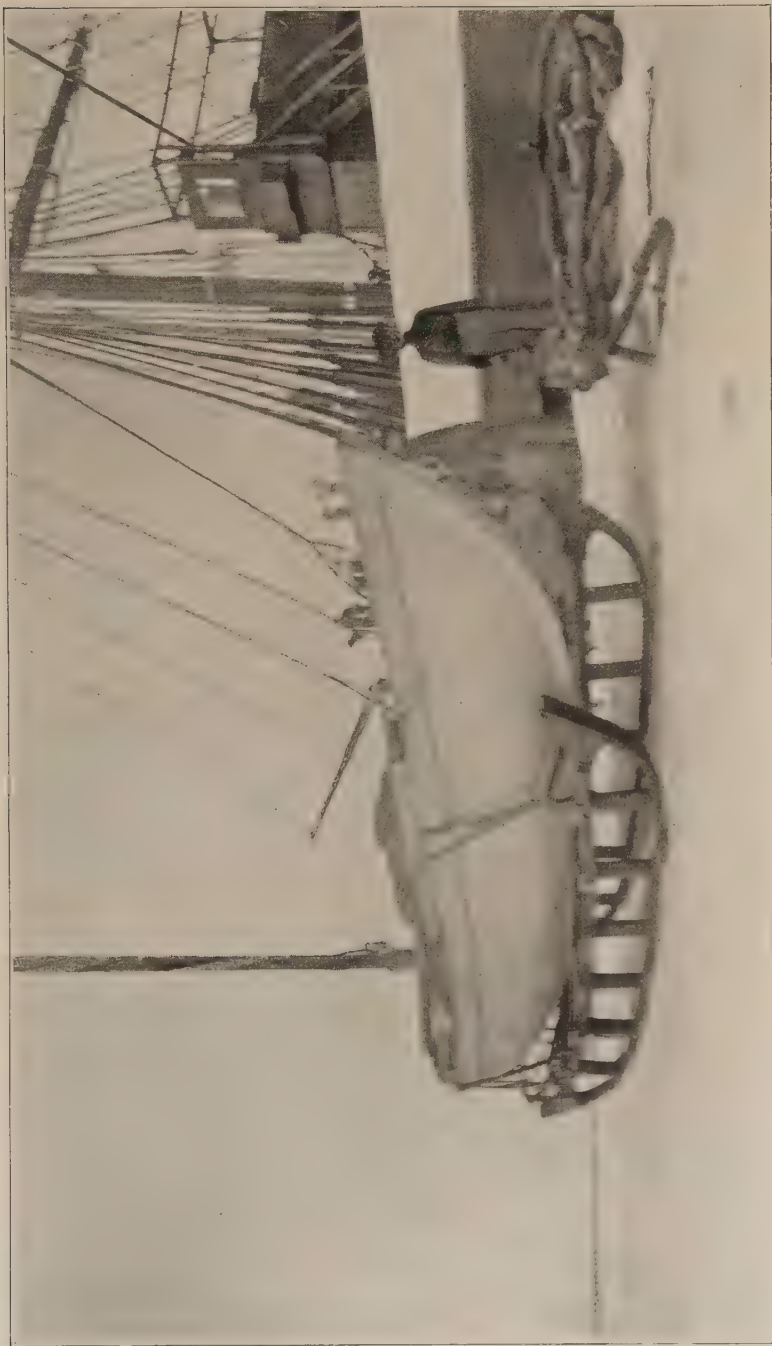
One of the sleighs was changed for a bone shod sleigh, and this sleigh was loaded for resuming the trip. The weather, however, remained very cold and boisterous, with snowdrift; in the meantime Quartermaster Lessard became sick, and Fireman Robson was selected to take his place. On the 2nd, 3rd and 4th, the wind was strong, sometimes blowing a gale, but the 6th being calm and fine, the parties again set out to cross McClure strait. Mr. Morin, second officer, was in charge of sledge No. 1, Mr. Green, third officer, in charge of No. 2, Quartermaster Chassé in charge of No. 3, and Quartermaster Vigneau of No. 4. A party from the ship assisted the sleigh parties for a distance on their way. On April 20, to our surprise, Mr. Green returned to the ship with three men who were frost bitten and could not proceed towards Banks island; the men were Seaman Simms, who had his two feet frost bitten, William Doyle, seaman, one foot frost bitten, and Seaman Tremblay, one foot frost bitten. The men recovered, and on May 1 set out again, but one change, however, was made, by substituting Boatswain William Anderson for Seaman Wakeham, who was found unfit to leave with Mr. Green.

Work and Incidents during April.

Coincident with the preparations made for the sleigh parties above described, other work on board ship and surroundings was proceeding. On April 1, the wind was strong from the westward, and on the 2nd had increased to 40 miles an hour from the north. On April 3, the breeze was strong from the north, the temperature 12 below zero and the snow drifting. On this day, we measured the ice, which was 84 inches thick. Mr. Jackson and Mr. McMillan with one seaman set out for Cape Bounty to make observations and collections of specimens of various kinds. The men at the ship were working at cutting ice from the rudder, which showed a thickness of 85 inches. During the absence of the several parties from headquarters the forecastle was cleaned and made ready for painting; the temperature was varying from 13 to 25 below zero outside, with strong wind, but the painting was commenced and continued.



Sleigh used in trip to Banks Island, made of Hickory.



Expedition Boat and Sleigh.

On April 14, we took our latitude by the artificial horizon, and found it to be $74^{\circ} 48' 46''$ north; the chronometer error was 4 minutes 22 seconds slow. The land was getting bare, caused by the constant wind, which on the 16th was blowing from the southeast. Mr. Lessard was sent out from the vessel to ascertain the state of the ice to the eastward and south; on returning, he reported that no sign of any cracks or openings were seen in the strait.

At this time an incident occurred which caused me much anxiety. I had expected the return of Mr. Jackson and McMillan, who set out for Cape Bounty on April 6, but had not returned up to the 24th. I held a consultation with the doctor and Mr. Vanasse, and as a result the chief officer was sent in search of these two gentlemen, but did not find them. I was apprehensive of some accident, and knew they were liable to suffer from hunger as they had not taken sufficient supplies for the length of time they were away, but fortunately on the 29th they returned, and as I apprehended, with very little to eat. Another regrettable incident that occurred at this time was the summoning of a seaman to the saloon, who was accused of abusing the doctor who had given him advice regarding his habits and health; fortunately for the maintenance of discipline, this was the first offence of the kind.

WINTER HARBOUR, MELVILLE ISLAND, April 29, 1909.

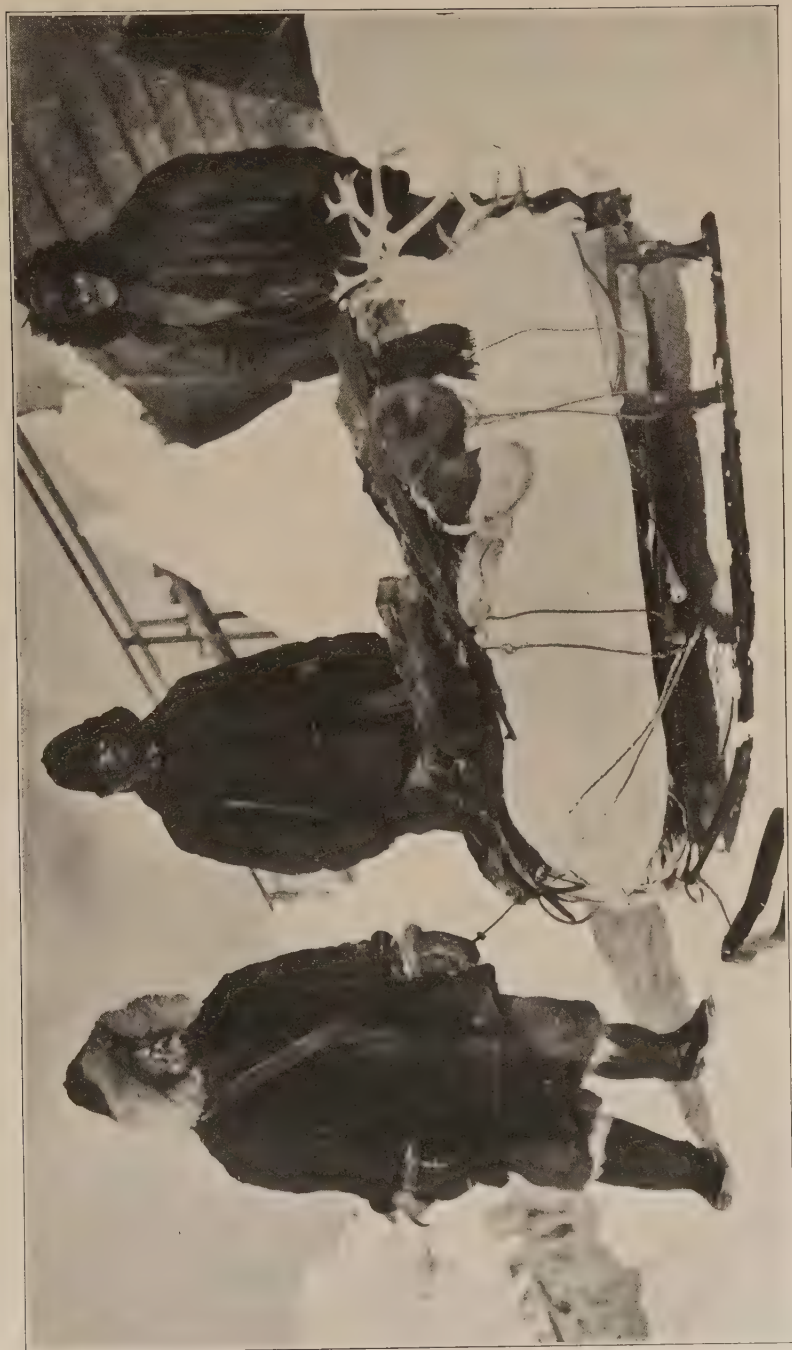
Capt. J. E. BERNIER,

Commander C. G. S. *Arctic*,

In winter quarters, Melville Island.

DEAR SIR,—I beg to submit the following report of a sled journey made by Mr. Jackson, the meteorologist and magnetic observer, Mr. Brace, one of your seamen, and myself, between April 6 and 27, extending from this point to the eastward as far as the western entrance to Skene bay.

Four camps were made and occupied for several days, in each case, during which I occupied the time available in making journeys on foot into the interior of island for distances up to ten miles for the purpose of studying the geological formation and features of economic interest, while Mr. Jackson was busied with observations



Three members of "Arctic" Expedition returning from hunting.

relating to terrestrial magnetism, on which work he will no doubt report. Four days were occupied in moving our sled and outfit as far as Dealy island, two in the return to the ship, eleven days by me in geological work, and one was lost, due to an encounter with a bear, and three at the end of our trip, due to stormy weather, which delayed our return to the ship by three or four days.

The first stop was made on the ice near the head of the bay immediately west of Cape Bounty, and two days geological work done from there. The second camp was dug out of a snow bank in the gap across Cape Bounty, about one and one-half miles from the western side of the cape and two and a half from the eastern side, and rather more than a mile from the cairn in a northwest direction. Four days work were done here going out and one on our return, when the stormy weather set in, delaying our return. The third camp was similarly made at the bluff headland, two miles west of the west entrance to Bridport inlet, and two days work done from there covering territory eight miles inland. The fourth camp was similarly made near the storehouse on Dealy island, which we found in much the same condition as last fall, except that rather more snow had drifted in. This was occupied for three days and two journeys made, one to the northeast for about seven miles and the other eastward for thirteen miles, or to within a mile of Skene bay. On April 21 we returned to our second camp on Cape Bounty, when, on the following day, I made a journey to the next ridge of hills some ten or eleven miles north, when numerous pieces of coal were noticed on the plain at an elevation of about 135 feet above the sea, between 8 and 9 miles north of Cairn hill, Cape Bounty. The return from this point to the ship was made on the night of April 26

The territory covered is of considerable interest structurally, on account of presenting successive tilted blocks of sandstone intermixed with shale as one travels to the northward. These blocks are tilted so as to dip about 10 degrees to the north and the south face of each block forms a ridge, rising sometimes to seven hundred feet above the sea, and four hundred above the plain in front and running approximately in an easterly direction. One of these runs out on Cape Bounty, and the next extends across Bridport inlet with an elevation of some two hundred feet and extends as far as the entrance to Skene bay.

The two days out from Dealy island were occupied in a careful search for the coal seam marked on the map accompanying Haughton's Appendix to McClintock's Narrative but without success. Peat was seen in the line of outcrop as marked but no coal even as loose pieces were seen in the part travelled between Bridport inlet and Skene bay, though clay ironstone nodules and pieces were numerous.

Thanking you for the outfit placed at my, or rather at our, disposal, and for the man provided to assist us, I remain,

Yours faithfully,

J. G. McMILLAN.

CHAPTER VI.

Midnight Sun.

May 2 was notable from the fact that the sun did not set below the horizon, and for the rapidly rising temperature, which on May 3 was 4 above zero. We brought on board our depot of provisions that had been temporarily left on the ice, and made other preparations for spring work. The extreme change from perpetual night to perpetual day enabled us to look forward to satisfactory explorations on land, and to the melting of the heavy ice which had bound us up in the harbour as with bands of iron. The first view of water, the effect of the sun's heat for 24 hours continuously, was obtained on May 3.

Mr. Jackson, the meteorologist, gave me the result of three observations taken during his trip to Cape Bounty, for variation. Cape Bounty, $107^{\circ} 9'$ easterly; Dealy island, $106^{\circ} 28'$ easterly; Bridport, $106^{\circ} 48'$ easterly. We, therefore, concluded that the variation had diminished since Parry's time. The variation in Winter harbour when the *Hecla* and *Griper* wintered in 1819-20 was 127 degrees, and when the *Arctic* wintered in 1908-9, it was about 98 degrees easterly. This variation makes quite a difference in the Arctic waters for navigating. For sledge travelling the only correct and reliable bearings are the sun's true bearings. Compasses were carried by the exploring parties, but were not used in fine weather. Every officer in charge of a party was provided with a pocket card, on which was marked the sun's bearing every twenty minutes for the twenty-four hours—that is during the long days. I regret that dogs were not available for drawing the sleds.

Our explorations and travelling would have been accomplished in much less time and more territory covered, and, as a consequence, a more extensive field examined by the scientific officers, and less hardship endured by the men on the expeditions to Banks island, if dogs had been available. Travelling is

extremely slow and hard work, for men who draw their own supplies over snow that will not bear the weight of the men. The reports of the officers sent to Banks island show the extremely arduous work performed by them on their trips across McClure strait, where hummocks of ice and deep snow impeded their progress. They also show that the exposure to extreme cold and high winds, which swept the unprotected strait, was prolonged by the necessity of drawing their own supplies and equipment. I, therefore, advise the precaution of providing dogs in similar expeditions, and suggest that 100 of them be obtained if the *Arctic's* work should be of the same nature as the voyage of 1908-9.

Collecting Specimens of Coal, Peat, &c.

On May 5, Mr. Fabien Vanasse, Mr. Frank Hennessey, assistant naturalist, Quartermaster Lessard and Emile Boldue went 12 miles to the westward of Winter harbour and 4 miles inland to look for coal, peat and natural history objects. They incidentally searched for a lake reported in that neighbourhood by one of the officers of the Parry expedition in 1819-20. The party from our ship had ten days' provisions, and the weather being fine, were able to pursue their explorations without much difficulty. Quite a number of pieces of coal were picked up near Point Phipps, and not far from that point, peat was also found in large quantities. Nature seems to have provided fuel in the form of peat which can be used, and in all probability coal, although of the latter, surface specimens only have been found here and there.

Fish Life at Winter Harbour.

On May 6, the water was showing under the stern of the vessel, and seeing some fish moving I, by means of a basket, caught three kinds of fish, one which proved to be a species of whitefish about 4 inches long. Some shell fish were also taken; and here, I might remark that the amount of fish life in these waters is astonishing. The fish were handed over to Mr. Frank Hennessey, who has some knowledge of taxidermy, and has made a report upon the animals, birds and fish caught during the expedition.

Return of Sleigh Expedition from Banks Island.

On May 8, five of the men who had been sent to accompany the sleigh expeditions had reported after their return to the vessel, that they had gone with Mr. Morin a distance of 30 miles southwest of Cape Providence, and on their way back had met Mr. Green and his party proceeding to Banks island, all well. The men were sent back to Mr. Morin, who found the heavy sleigh with its load impeded the progress of the whole party over the strait. They were instructed by Mr. Morin to return to Cape Providence and remain twelve days, awaiting his return, and after that length of time to return to the ship. At the end of the twelve days, Mr. Morin had not returned to Cape Providence, and the five men came back to the *Arctic*.

Mr. Morin and his companions, Napoleon Chassé and Reuben Pike, who had been sent to Banks island and Victoria island for the purpose of annexing these lands to Canada, arrived at the ship on May 10. The report of Mr. Morin furnishes a detailed account of each day's journey performed, under the greatest hardship owing to the difficulty of travelling over rough hummocky ice with deep snow in the depressions, and to the destruction of their food supplies by bears and their oil fuel running short. The loss of these supplies, temporarily cached about 5 miles from Cape Russell, Banks island, prevented Mr. Morin from continuing his trip to Princess Royal islands, which he proposed doing. Mr. Morin did not meet with any success in finding McClure's cairns either at Cape Russell or Mount Observation; he, therefore, came to the conclusion that the cairns erected by McClure could not have been substantial enough to withstand the gales of the locality, which are frequent and heavy from the north and east. The absence of rock led him to suppose that the cairns must have been constructed of sand and gravel, the only material at Cape Russell that could have been employed for erecting a cairn.

The three men accomplished the work of annexing Banks island and Victoria island, and left records at Cape Russell, of the annexing of both islands.

The report of Mr. Morin to me is here inserted, as it forms part of my report, and completes the account of the transac-



O. J. Morin, Second Officer ; Napoleon Chassé, Quartermaster, and Reuben Pike,
who went to Banks Island and Victoria Island.

tions of the expedition up to May 10, except the scientific observations.

Report of O. J. Morin to Victoria and Banks Island.

J. E. BERNIER, Esquire,

Captain of C. G. S. *Arctic*,

Commander of the Cruise, Royal Commissioner specially
appointed for the purpose of taking possession of the
Arctic islands in the name of Canada.

SIR,—I have the honour to report on the expedition intrusted to me by your orders received on April 6 last (1909).

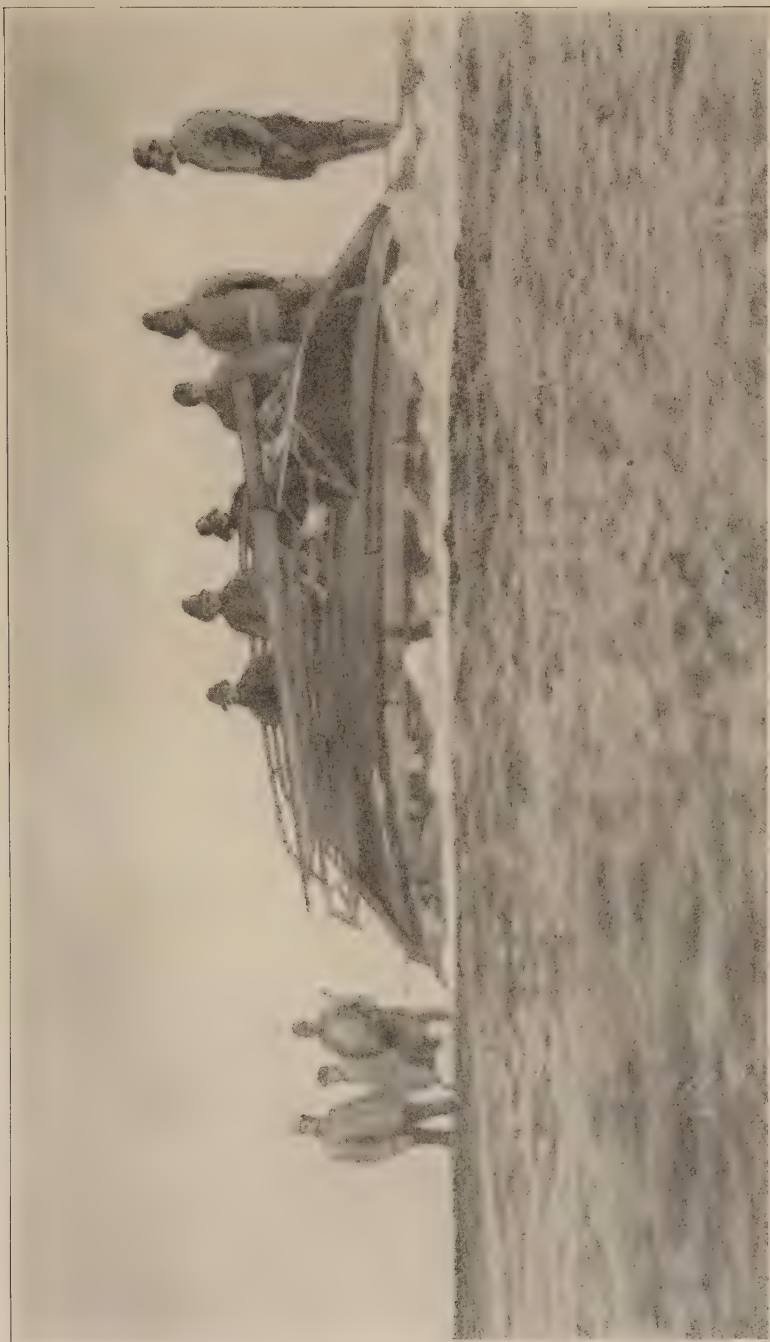
I left the C. G. S. *Arctic* at 8 a.m., April 6, 1909, for Victoria and Banks island, reaching the point at which provisions were left for this expedition, on March 31, 1908, at 12.15 p.m. of the same day. On reaching this place I found out that the camp had been visited by bears, and found the tents torn to pieces and the provisions scattered all about the place on the snow. Two sleeping bags and a fur suit were completely destroyed and utterly useless. We were occupied the rest of the afternoon in repairing the tents and gathering up the supplies and getting everything in readiness to proceed on our voyage to Cape Providence, where we could again provision up from the caché left by you in the fall of 1908.

April 7, 8 a.m. Temperature 10 degrees, wind southwest.

We broke up camp and started out in the direction of Cape Phipps, which was the land in view furthest west. The ice was very rough and the marching was very tiresome. At 2 p.m. we halted to place the runners on our sledges, and at 4 o'clock we were opposite Point Phipps, where we camped over night.

April 8.—We broke camp, and at 8 a.m. were again on the trail; the temperature was cold and the thermometer registered 14 degrees with a northwesterly wind at 3, that is at a velocity of from 16 to 17 miles an hour. At this point the ice on the Strait was smooth and marching easy, and at 11 a.m. we were opposite Point Clarendon. I waited at this point for two of our sledges that came at some distance behind, and which again joined us at 12.15 p.m.

The light morning wind had attained a great velocity, and the men complained of the bitter cold as we marched on. At 3 p.m.



Cache left at Cape Providence..

we erected our tents for the night, and while this was being done I, with seaman John Bodeker, walked up to the highest hill to make an observation as to the condition of the ice in the westerly direction, where we were to follow on the next day. Our faithful dog, Arctic, had accompanied us to this point. As we marched along I noticed at a few miles distance, in a ravine, a herd of musk oxen and sent Bodeker out to hunt them, and he was lucky in killing one, which provided us with the luxury of fresh meat for our journey and to leave a quantity in a caché in case of future need. When Bodeker fired to kill his ox he had the misfortune to hit with the same bullet our dog Arctic, which was playing havoc with the herd; the bullet struck him in the thigh, and he soon after died. At 11 p.m. we returned to camp and told the men of the sad end of our faithful friend Arctic. This accident was much regretted by all, as Arctic was our best night watch. He, the previous night had given the alarm of the approaching of the bear that had ripped up our tents.

April 9.—At 7 a.m. we resumed our march. The thermometer registered 15 degrees below zero, with a northwest wind, rating from 11 to 12 miles per hour. We reached at 3 p.m. the caché left at Point Clarendon. The ice on this march was very easy, and the caché was found in the same condition as we had left it last fall. At 3 p.m. the temperature registered 10 degrees below zero with northwest wind, velocity 5 or 6 miles per hour. Our tents were now pitched near the caché. On this day we were fortunate enough to kill a bear which was following one of the men who had ventured some distance from camp.

April 10.—At 6 a.m. the thermometer registered 22 degrees below zero, at 8 a.m. 20 degrees, and at 3 p.m. 18 degrees, the wind was blowing in a westerly direction at a velocity of 16 to 17 miles. The day was passed in making preparation for the crossing of the Strait at the extreme northeast of Banks island. Four of our men went out on a hunting expedition and returned with fourteen rabbits, which provided a great meal for the celebration of Easter, which was on the next day. One bear was sighted by the men but was out of range. From this camp I took two sleeping bags and one tent to replace the ones which were found destroyed at the first caché.

April 11.—At 8 a.m. the thermometer registered 20 degrees below

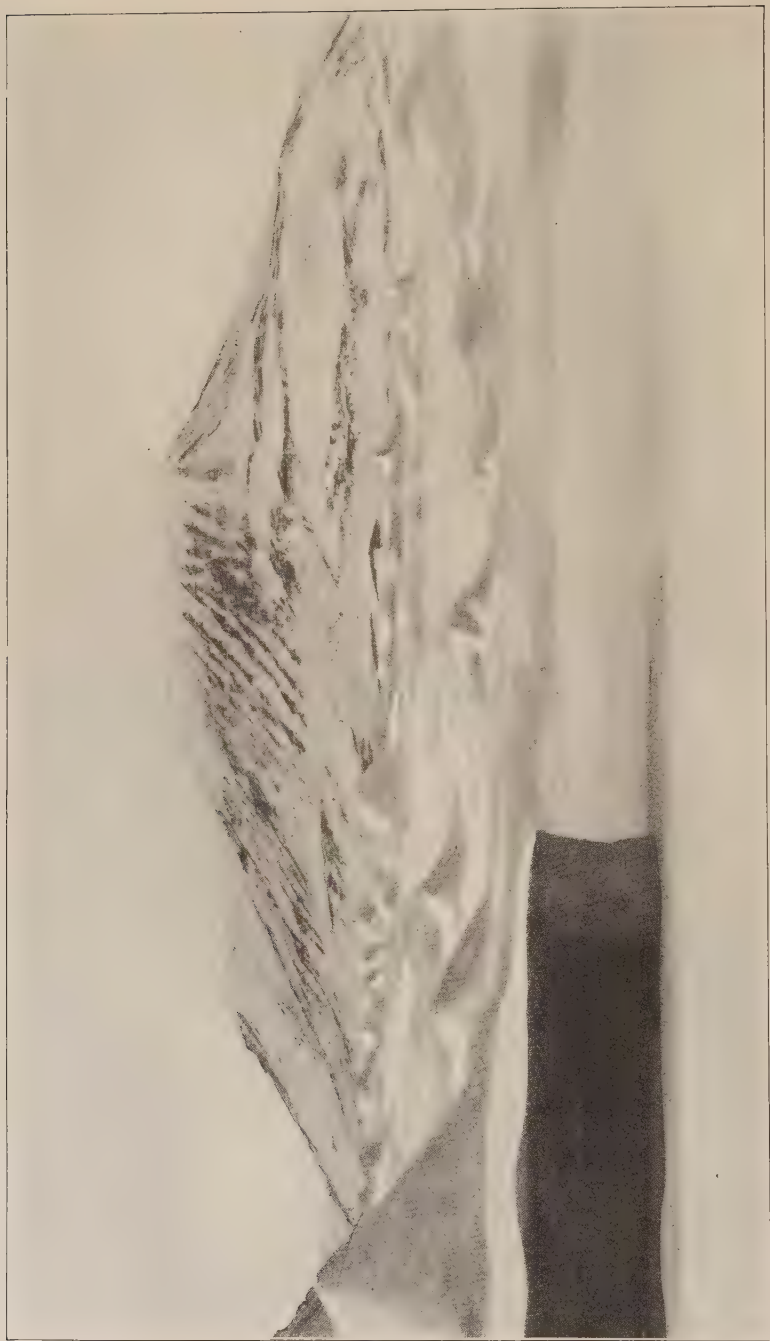
zero, the wind blew northwest, velocity 16 to 17 miles. We had but time to remember that it was Easter Sunday, so well celebrated throughout the world, and marched on till 10.30 a.m., when we found ourselves opposite Cape Providence, where we camped. The rest of the day was spent in visiting a cairn erected by explorers in 1853, on the highest elevation. A search was made, but no records were to be found in the cairn, and I left therein a record of our visit to this historical Arctic locality.

April 12.—The thermometer registered 20 degrees below zero, and a moderate wind 10 to 11 miles was blowing; we marched out from Cape Providence at 8 a.m. in a southwesterly direction; the wind being favourable we set the sail up on our sledges and halted at 12 noon for dinner. At 2 p.m. we resumed our travel and tramped over very rough ice, making the journey a hard one. We were now marching on thick packed ice on the Strait. Great difficulty was experienced and the full force had to be put on one sledge, and all sledges had to be hauled over one by one. Owing to these difficulties only a short distance could be covered and the men were tired out, we then set our camp for the night and while cooking our supper we had the visit of a splendid specimen of a bear which I was lucky enough to kill.

April 13, 8 a.m.—The thermometer indicated 27 degrees below, and we had but little or no wind. The tramp here was a hard one and very fatiguing, owing to the rough condition of the ice over which we had to travel, and nothing but packed ice could be seen from our present position. In the direction that we went the march was slow, and at 4 p.m. we halted for night. Green, who had taken a different route, expecting an easier road, reached camp only at 7 o'clock with two sledges.

April 14.—Temperature was 22 degrees below, wind 5 to 6 miles per hour, blowing from a westerly direction. We made a start at 8 a.m., and when we stopped for dinner at 12, noon, Green informed me that one of his men had a foot frozen. I then decided that Green, with seven men, should return to the steamer *Arctic*, and the start on the home journey of this party was begun at 2 p.m., and I, with the seven men left, headed for the land on Banks island. We marched till 5 p.m., and then pitched our tents for night.

April 15.—The ice was now becoming so irregular that I decided that it was not practicable to go any further with our large



Cape Providence, Melville Island,

sledge, with its heavy load, and I ordered it to be returned to Cape Providence at the caché, and sent back five of my men. I kept on the journey towards Banks island with the smaller sledge and two men, and took provisions for fifteen days. Quartermaster Napoleon Chassé and Reuben Pike were now my only companions on this march, they both having volunteered to follow me. My instruction to this last returning party was to wait for twelve days at Cape Providence, and in the event of our not returning then from Banks island they were to return to the steamer *Arctic*. The temperature was 24 degrees, with a westerly wind of from 11 to 12 miles per hour. The parties left in opposite directions at 8 a.m. We halted and camped for the night at 6 p.m.

April 16.—The thermometer indicated 22 degrees below, wind northeast, velocity 15 to 16 miles per hour. We left at 8 a.m., Chassé, Pike, and myself hauling the sledge with a load weighing three hundred pounds. The journey was a hard one on account of the cold, the wind and the rough condition of the ice, which was still becoming more impracticable as we travelled towards Banks island. We halted at 4 p.m. and built a snow hut, as we were now deprived of our tents which we had left with the returning party. All three of us were in splendid physical condition.

April 17.—We suffered much from the cold during the night in our snow hut, and I was not surprised to find the thermometer registering 36 degrees below zero at 6 a.m., the wind was blowing in a northeasterly direction all day the same temperature prevailing in our hut, as we had found it impossible to use our stove. We spent the day repairing our stove, and succeeded only at 3 p.m. to start a fire. We rebuilt a more comfortable hut and remained there for the coming night, having made no progress this day.

April 18.—Sunday the temperature was 24 degrees, wind southwest, velocity 5 to 6 miles per hour. After having spent a comfortable night we started out at 7.30 and travelled on till 5 p.m., having taken our dinner while on the way. During all this time we had advanced but 7 miles through rough packed old ice.

April 19.—At 8 a.m. we were on the way, always travelling on the Strait and over the same ice conditions as the previous days, and we sighted for the first time the land on Banks island. We experienced more trouble with our stove and camped for the night at 4.30 p.m.

April 20.—We made to-day a very long and hard march with but 5 miles advance. The camp was truck at 1.30 a.m. and no halt was made till 2.30 p.m.; owing to the bad condition of the ice we were forced to carry our provisions in lots from mile to mile, making several trips back and forth. The ice was in the shape of pyramids and peaks, and we experienced great difficulty in getting through. At 12, noon, we stood at a distance of 19 miles from Banks island, and I took advantage of the sunshine to make an observation and ascertain at what latitude we stood. The thermometer registered 20 degrees below, velocity of wind 5 to 6 miles.

April 21.—Th thermometer indicated 12 degrees below zero, wind east blowing 12 miles an hour. We left our igloo at 7 a.m., marching till 3 p.m., during which time we covered 6 miles, the ice still very rough, and on account of a storm we could not see anything further than 20 feet in any direction, the drifting snow was simply blinding, and we are forced into camp for night; all are well notwithstanding the hardship of the journey.

April 22.—Eight a.m., temperature 12 degrees below, westerly wind with a velocity of 11 to 12 miles per hour. It snowed heavily all night and the storm was still on, nevertheless, we started out and marched on till 12, noon, when the storm was about over and the atmosphere cleared up, and for the second time Banks island could be sighted; we were now camped at 2 miles distance from the coast. Temperature 8 degrees below.

April 23.—This was a grand morning. The sky was clear and the sun shining bright. In making an observation I noticed that we had gone somewhat out of our course and were now opposite the bay between Cape Sandon and Cape Parker. The ice here was smooth and was young ice formed during last winter. We left this point at 9 a.m., travelling steadily till 3 p.m. We now stood a bit west of Cape Parker, where once more we encountered rough ice. We set our camp for the night at this spot. We now stood at a distance of 16 miles from Point Russell, which was the terminal place of our expedition. At 8 a.m. the thermometer registered 12 degrees below, wind westerly, velocity 15 to 16 miles.

April 24.—Eight a.m., westerly wind, temperature 4 degrees. The tramp had been resumed at 7 a.m. over very rough ice, making an advance of 8 miles towards Russell Point. The weather being clear, I managed to take a good photograph of Cape Parker,

and it was 5 p.m. when we went into camp. During this day's journey we were again forced to carry our supplies on our backs owing to the state of the ice on our route.

April 25.—Eight a.m., temperature 17 degrees, westerly wind, velocity 16 to 17 miles per hour. The march was resumed at 5.30 and lasted till 4 p.m.; during these weary hours we only succeeded in covering a distance of 3 miles. We were now camping at a distance of 5 miles from Russell Point; all felt tired out. The roughness of the ice and snowdrifts were beyond description, and we often sank down to our necks in the drifts accumulated during the last storm, nevertheless we felt in good spirits at the idea that possibly we would reach the mark on the next day.

April 26.—Notwithstanding the storm we started on the march at 9 o'clock, and at 11.30 we had covered a distance of $1\frac{1}{2}$ miles, and we decided to camp at this spot. We now stood at a distance of about 1 mile from the coast and about 4 to 5 miles from Cape Russell. At 3 p.m. the weather had cleared up and I started out for the coast and Cape Russell, where I made a search for the cairn erected by Sir Robert Lemesurier McClure in 1850. After searching for many hours I gave up the idea of finding it, as it has disappeared, either being covered up by the sand or destroyed by wind. No trace whatever could be found of it. The surface of Cape Russell is of sand and gravel. Under those conditions it must have been difficult in 1850 to find enough stones for the erection of a cairn. A cairn erected with this gravel and sand could not have withstood the high winds to which Cape Russell is exposed, on the north and west sides.

April 28.—At 2 a.m. the thermometer registered 7 degrees below zero, and the velocity of the wind was 5 to 6 miles an hour, blowing in a westerly direction. I despatched my two companions, Napoleon Chassé and Reuben Pike, to Peel Point on Victoria island to take possession of this island in the name of Canada and to visit Capt. Collinson's cairn, erected in 1851. I, through Prince of Wales strait, made for McClure's Mount Observation, situated on the east coast of Banks island, being 16 miles from the mouth of the Strait. Throughout this journey I travelled over smooth new ice. I sighted during the day, on the Strait, two polar bears and three rabbits. When I reached Mount Observation I made a search for McClure's cairn, erected in 1850, but could find nothing of it. The same con-

dition here prevails as at Cape Russell. Nothing but sand and gravel is to be seen, and I suppose that the same happened to McClure's cairn that occurred at Cape Russell. After a search of a few hours I made for camp again. By this time a fearful storm was raging over this vast desert. The wind was now blowing in a northwesterly direction, which raised a real blizzard. I was unable to see any distance ahead of me. I kept walking on the Strait till I was nearing Cape Parker, on the east side, and I only reached camp after a tramp of thirty-three hours. I was in an exhausted condition and suffered much from being snow-blind. I could hardly see at all. It was now 11 a.m. of April 29. My companions had made Point Peel on Victoria island, and had returned after a twenty-six hours trip. They took possession of the island without leaving any records, failing to find Collinson's cairn, and not finding enough stone to erect a suitable cairn, that would have lasted any length of time. The thermometer registered 12 degrees below zero, and a northwesterly wind blew all day at a velocity of 35 to 40 miles an hour. During our absence polar bears visited our igloo, and destroyed our blanket, which we used for a cover for our sledge and a roof for our igloo, and also completely destroyed our sleeping bags, and had eaten up most of our provisions. After gathering everything that we could find, we summed it up as follows:—Thirty-three biscuits, one five-pound can of ham, and four pounds of bovril, and the total quantity of oil we had left was contained in the stove's tank. This was all we had to undertake a return journey towards Cape Providence by McClure strait, a distance of from 60 to 65 miles over the roughest ice that could be encountered. If provisions failed us, we still had our courage and, weather permitting, we decided to trust to God, and would start homewards on the next morning.

April 29.—Eight a.m., temperature 4 degrees below, a westerly wind was blowing at a velocity of about 50 miles an hour, with a terrific blizzard on the Strait made it impossible for us to make a move, our rations this day was one biscuit each, and when night came we retired to our snow hut for a night's sleep, not fearing to be troubled with indigestion.

April 30.—Eight a.m., the wind was blowing northwest at 15 to 16 miles an hour, and the thermometer register, 6 degrees. Under the conditions existing I considered that it would not be safe for

us to undertake the trip to the islands of Princess Royal by Prince of Wales strait, and decided it would be wiser to return to Cape Providence, where was the nearest point to obtain a new supply of provisions and then make for Princess Royal island if we had to go. Consequently, at 4 a.m. this morning, after leaving our records of taking possession of Banks island, Victoria, and King William islands, at 5 miles west of Point Russell, near a high rock. The records were deposited in a bottle, that I afterwards covered with a quantity of stones. We travelled in the direction of McClure strait. After a four-hour's march we took refuge for the night in a snow cave. The three of us were suffering much from snow-blindness.

May 1.—The night was far from being comfortable in our igloo, without any blankets left or fuel. It was impossible to make any use of our stove, and we could not sleep for an hour. We started out early in the morning, and after one hour's walk we were forced to halt again after covering a distance of 2 miles. We then endured the greatest hardship and sufferings of the whole trip owing to being snow-blind, and as for food, we had only a few biscuits left upon which we could feed. The thermometer registered 6 degrees below, wind northwest, velocity 25 to 30 miles an hour. At noon the thermometer rose to 2 degrees below, but soon fell again to 6 degrees with a continual high wind that raised a blizzard over the Strait.

May 2.—We left our igloo at 2 a.m., not being able to stand the severity of the cold any longer, and had a hard tramp till 3 o'clock p.m., during which time we covered a distance of 9 miles. We suffered a great deal from thirst, which is far worse than hunger. The temperature varied from 12 degrees to 8 degrees below, and a northeast wind was blowing at a velocity of 16 to 18 miles per hour.

May 3.—We left our camp at 2 a.m., and travelled under the same unfavourable conditions as on the previous day, as the weather was unchanged. After marching for two hours we found on a block of ice an uprooted tree about 30 feet long, 14 inches diameter at the centre. It was a red spruce. It did not take our companion Chassé long to be exercising himself with his ax, and in a short time we had burning a comfortable bonfire at the opening of our igloo. We took this opportunity of warming up and sleeping for a few hours; we melted snow, which provided some water. The



Log found in McClure strait drifting eastward with ice.

temperature varied from 12 degrees to 6 degrees below, and the wind was still blowing at 20 to 25 miles an hour in a northeasterly direction.

May 4, 1909. Tuesday. Temperature at 6 a.m., 2 degrees below zero, at 8 a.m. 2 degrees below, wind southwest and from 15 to 16 miles an hour. At 1.30 this morning we left our bonfire, to continue on our way towards Melville island. At 2 p.m. we camped, having gone 14 miles. We began again to suffer from thirst. I do not need to mention hunger, that made the journey with us in a very intimate fashion, never leaving us except to catch up with us again in a short time. Our provision of water was all used up, and we had nothing to renew it. There was a very unpleasant prospect for the morrow, to eat snow when one is thirsty is like trying to put out a fire with oil; but sufficient unto the day is the evil thereof. We travelled over hummocky ice which made walking very difficult. Our eyes suffered constantly from the snow, in spite of all the care we gave them, according to the doctor's orders.

May 5, 1909. Wednesday. Temperature at 6 a.m. 9 degrees below, at 8, 8 degrees. We left this morning at 7.30. At 11 a.m. we had gone only 4 miles. Not being able to resist our thirst any longer, I made up my mind to sacrifice our sledge, in order to make a fire to melt snow, to assuage our thirst, and give us a sufficient provision of water to allow us to finish the journey. We had only four biscuits left, so I considered that we did not need the sledge to carry them the 32 miles which still separated us from Cape Hay, Melville island.

May 7, 1909. Friday. At last we reached our caché at about 5 o'clock in the morning, not only tired out, but physically exhausted from hunger and thirst. Since Thursday morning we had been travelling in a very dense fog; and we walked without stopping, even to eat, as we had not a crumb of a biscuit, even, left to satisfy our terrible hunger. In the course of the day (yesterday) we came to smoother ice, which ran along the coast of Melville island. About 6 o'clock Thursday we landed at Cape Dundas. We had still 22 miles to cover before reaching our destination. We did not dare to rest for fear of going to sleep, perhaps forever. Our companion Chassé encouraged us by declaring that we were not going to stay there and freeze to death, we would get to the caché if we had to crawl on our hands and knees. We had become

almost completely snow-blind. When we got to Cape Providence we found Mr. Green and his party comfortably sleeping in their tent. It was Mr. McMillan who came out to meet us, and, after taking a little food, we lay down to rest. We spent Saturday here. Having lost my thermometer, I could not take the temperature on Thursday.

May 9, 1909. Sunday. We left the depot at Cape Providence on Saturday night at 8 o'clock, for Winter harbour, where we arrived that evening at 9.30, having covered in twenty-five hours the 37 miles between the caché and the ship.

I am, Sir, your obedient servant,

O. J. MORIN,
Second Officer.

On board C. G. S. *Arctic*,

July 11, 1909.

Caulking the 'Arctic' and Sounding Winter Harbour.

On May 11, all of the snow which had surrounded the topsides of the vessel had disappeared, and I set the carpenter and seamen at work caulking the vessel. The chief officer and myself began the sounding of the harbour, and this work was not completed until the end of the month. Some partridge made their appearance, and the first one for the season was killed from the deck of the ship. The different angles of the harbour were marked during this week. The carpenter and myself were occupied in altering a sleigh for the Morin party from bone to steel shoeing, which was found a great improvement in the spring.

Mr. Morin prepared to make the second trip to Banks island, and this day, the 17th, started in the rain, the first of the season. The men who accompanied him were William Doyle, William LeBel and Reuben Pike, all able-bodied seamen. Mr. Keonig, chief engineer, and Joseph Lessard accompanied the party as far as Cape Providence. It was expected that the party under Mr. Green would be met with on their return to Cape Providence, and if not, that Mr. Morin would be able to ascertain if any mishap had occurred; instructions were also given to place records on Victoria island and Banks island, and to search for coal and localize seams, and bring back any records that could be found. On the 18th, there was a strong breeze from the north-northeast, which was fair for the outgoing party.



Napoleon Chassé skinnig a Musk Ox, spring of 1909, on Melville Island.



Musk Ox killed at Winter Harbour, 1909.

Resuming Hunting in the Spring.

The musk oxen were beginning to appear in larger numbers; thirteen of them were killed for fresh meat and one very young one was taken alive. This animal was cared for by the steward and waiters, who fed it on concentrated milk and porridge. All hands that could be spared from the ship were sent to bring the meat of the thirteen oxen to the vessel; their flesh proved very acceptable.

Cleaning and Painting the Ship.

The rest of the week was occupied in scraping and cleaning the vessel preparatory to painting. She was overhauled, and the painting was done throughout the ship, including the engine-room, putting her in better order even than when she left dock. The *Arctic* had proved, during the winter, fairly comfortable quarters, and no one suffered hardship except through imprudence or lack of energy to look after himself. Some of the bed clothing became damp, partly by the opening of doors frequently, which admitted cold air laden with moisture, and partly from steam from the cooking or ice melting. The lack of attention to the discipline which required the men to report cases of the kind mentioned, may have led to some discomfort. By weekly inspection of the bed clothing by the doctor and officers of the ship, we discovered the condition of the clothes, and in every case orders were given to take the damp clothes below to the engine-room or vicinity of the stoves, to be dried.

We had on board three chronometers, one of which stopped on May 20; the cause no doubt being dampness arising from the opening of the door of a room frequently, to examine the wind and tide gauge. The chronometer was found to keep time afterwards in fine weather, but required rating. The wind gauge was self-registering but the tide gauge was not, making it necessary to observe every ten minutes for half an hour before high water and half an hour before low water. At other stages of the tide the observations were made hourly.

May 23, was disagreeable; the wind blew from the north and the drifting snow prevented any one from going ashore. The religious service was well attended, and throughout the

day the men were principally engaged in reading. I may here, however, remark that some of the books on board were not as instructive as desired. If instructive books of voyages, history and other useful works only are supplied the men, they are willing to study, learn and become informed.

Victoria Day.

May 24, Victoria day, was observed as a holiday. Our flags were hoisted in commemoration of the glorious reign of Her late Majesty. The day was celebrated by the officers and crew going on shore to engage in any amusement or diversion that might be chosen. The walking exercise was beneficial to the men who had been confined to the ship. All, however, returned for dinner, at which the piece de resistance was bear steak; it was considered palatable on board the *Arctic*, but would not be declared a delicacy at home. Our only source of entertainment on board were a few speeches in reply to suitable toasts for the occasion.

Building Beacons in Winter Harbour.

The balance of the month was spent in building leading stone beacons in the harbour for the guidance of vessels entering or departing. Every fine day was utilized for gathering stones and erecting beacons. A plan of the harbour had been made, and the beacons were begun with a view of making the course safe to a point where the *Arctic* dropped her anchor at the close of our outward voyage. The weather during the latter part of May was variable, and the work was at times interrupted by gales and snowdrift. We had originally considered that about eleven beacons would be necessary in order to avoid all dangers in entering the harbour, and proceeded with the work according to this plan. The harbour although having sufficient depth of water for large vessels along the range of beacons, is exposed to heavy local winds. Heavy gales were experienced in the latter part of May, and the 1st of June entered with a lion-like storm, the wind blowing at the rate of 80 miles an hour with snow drifting fiercely. No work could be done outside the vessel on days like May 31 and June 1. To my surprise, I learned that the gales in which we were com-

pelled to suspend work were not felt by the men who were at Cape Providence. It is possible that the winds that come from the north and northwest across Hecla and Griper bay and Liddon gulf are lead in the direction of Winter harbour; (Hecla and Griper bay was named by Parry after Parry's vessels) whether this is so or not, the absence of these high winds at Cape Providence, about 35 nautical miles west-southwest, causes the climate at the Cape to be far more agreeable than at Winter harbour. The wind for the average of each month is far higher than any other place in which we had previously wintered, but the weather was clearer.

The harbour, apart from the high winds, is a favourable place in which to winter, owing to tidal cracks in the ice, which give a chance to vessels in the spring to escape from the ice and get into open water. Wintering in an open bay is not safe, as the ice in the spring, which has made around a vessel, moves in a body and carries everything with it. Vessels of former expeditions to this vicinity were lost by being carried along helplessly by heavy ice which had formed around them during winter.

Winter harbour affords great opportunities for laying in supplies of fresh meat. We were able, by our own efforts, to furnish the ship with all the meat consumed on board during the fall, winter and spring. No expedition, so far as I am aware, enjoyed so much fresh meat as we were able to put on board at the beautiful island of Melville, and Winter harbour proved a convenient point from which to pursue hunting. Scurvy, the great terror of Arctic explorers who live on salt provisions, was not known on board the *Arctic* during our sojourn at Melville island. The suggestion to adopt game regulations for other places, notably in Ellesmere land, are here made with more emphasis for Melville island, which may prove a valuable centre in future patrolling operations and in the extension of Canadian jurisdiction.

The general daily occurrences in the latter part of May and early June, which I deem it important to note on account of their bearing upon our voyage, and for the general information relating to birds and animals, are here recorded.

Mr. McMillan, the geologist, who had been exploring parts

of the island, returned to the ship on May 25 from Hearne point. He reported that the party which accompanied Mr. Green part of the way across the gulf, had returned to Cape Providence, all well, but some were suffering from snow blindness, although goggles were taken by the men. They were not always serviceable owing to the unsuitable shade of glass for the strong and blinding rays of the sun reflected by the snow.

The party arrived on May 29, at the ship, in charge of Thomas Olden, as Quartermaster Chassé was suffering from snow blindness. The party shot on their way to the ship several ptarmigan, and we heard for the first time wild geese going north of us.

A storm on the first of June suspended our work outside at the beacons, but the men were employed in the fore hatch taking out stores for the month. We found it necessary to remove six months' provisions to get at our coal underneath.

We resumed the work at the beacons on June 3; the carpenter and myself prepared casks to surmount the stone beacons. On June 5, we took soundings outside the harbour, and found the ice 91 inches thick. I went 4 miles to the south of the vessel, but did not see any sign of water. Soundings were also taken within the harbour on the 7th, on the ranges, and we had 7 fathoms least depth. The men were engaged painting the beacons; those beacons having the land for a background were painted white and those on the sky line were painted black. The beacons were substantially made, having a diameter of 9 feet at the foot and a height of 8 feet, in the case of the beacons furthest inland; the others were smaller, and all built on land or rocks.

CHAPTER VII.

Return of Party from Bay of Mercy.

The party with Third Officer C. W. Green, numbering seven men and himself, which had been sent to Bay of Mercy to examine the cairn left by Lieut. McClure on his voyage from Behring sea to Banks island, and to locate a coal seam 9 miles east of Cape Hamilton, returned to the ship on June 11. Mr. Green was instructed to search also for the remains or signs of the ship *Investigator*, abandoned in 1853 by Captain McClure, and also to look for a depot of a large amount of stores left by Commander McClure and Captain Krabbie in 1854.

To prevent confusion of the parties sent out, I may here mention that Mr. Morin, whose first report precedes the report of Mr. Green, was sent to Banks island in April, and on his return to Melville island met Mr. Green and his party going to Bay of Mercy. Mr. Green refers to the exhausted condition of Mr. Morin's party in his report, and the closing part of the report refers to the coincidence of events and exhausted condition of Mr. Green's party on their return to Melville island. The hardship of both trips returning from Banks island across McClure strait was similar. In both instances, the men were short of food, in both instances bears had destroyed their provisions, and in both cases they would hardly have been able to proceed farther without immediate assistance.

The simple narrative of each trip gives a concise but interesting account of the daily hardships endured by those sailor men in their attempt to bring to civilization records of the early explorers of the Northwest passage. Some of the remains of cairns erected by McClure were found, and his account of his trip from Behring sea as far east as Banks island confirmed, but the records alluded to in the documents discovered by us, on Melville island and published in this report, were not found by either Mr. Morin or Mr. Green. The evidence of McClure's visit to Bay of Mercy rests upon the published record, confirmed by the remains of depots in Banks island at several points.



Charles W. Green, Third Officer.

The report of Mr. Green to me is here inserted, to complete observations in the order of occurrences up to June 11, in connection with our expedition.

Report of Mr. C. W. Green of Trip to Mercy Bay, Banks Island.

To J. E. BERNIER,

Commander of the *Arctic*.

Saturday, May 1, 1909.—I left the ship at 10.40 a.m., with a party of seven men and with orders from yourself to proceed to Bay of Mercy, Banks island; we travelled till 1.30 p.m. and stopped for dinner, after which we again proceeded till 7.45 p.m., and camped for the night. After having travelled 12 miles during the day, ther. minus 4 a.m. plus 4 p.m.

May 2.—We broke camp at 11.40 a.m., with light east wind and thick, hazy weather, and travelled till 3.30 p.m., when a stop was made for dinner; we travelled till 8.15 p.m., and camped for the night about 2 miles east of Pt. Clarence. The travelling to-day has been hard and trying on the men owing to snowdrifts and soft snow, some of those drifts are from 8 to 10 feet high, and care has to be exercised in getting our sleighs over them. After supper I went on shore and travelled for four hours in a west-northwest direction in search of a record supposed to have been left by Lieutenant Park, but as I could not find any trace of it, I returned to camp at 2.45 a.m., ther. a.m. showed 5 minus, p.m. 4 plus. Distance travelled to-day 12 miles.

May 13.—Began with moderate gale east and drifting snow, which compelled us to keep in camp; this morning at noon, it began to moderate, ther. showed 17 minus.

We broke camp at 1.30 p.m. and travelled 3 miles, when the wind increased to a strong gale from east-northeast with drifting snow, we were again compelled to camp and wait for a clear-up, ther. p.m. 18 degrees minus. Distance travelled, 3 miles.

May 4.—Began with calm and overcast sky, little snow falling, had breakfast and broke camp at 6 a.m., and travelled until 11 a.m., when a stop was made for dinner, after which we again travelled till 3.30 p.m., when a strong breeze from the southwest sprang up, I decided to go into camp, ther. showed 15 degrees, minus, and 20 minus p.m. Distance travelled 13.50 miles. I may here state that Mr. McMillan, Geological Survey, with commander's permission,

accompanied me as far as Cape Providence, leaving us in the morning to return to *Arctic*.

May 5.—Begins fine and clear with light wind southwest; broke camp at 8.45 a.m., and travelled along shore till 1.15 p.m., stopped for dinner and then proceeded towards caché, which we did not reach till 8.15 p.m. At 3 p.m. I sighted a sleigh and party coming towards me, which turned out to be five of Mr. Morin's party going back to the ship.

May 6.—Began fine and clear with light breeze easterly. At 9 a.m. I went to the caché, and took the necessary provisions for my trip to Banks island. I also discarded the large sleigh, which I found too heavy to drag over the snowdrifts and rafted ice and put my men to work strengthening the light sleigh which I took from caché, this work took remainder of the day to complete.

May 7.—Began with overcast sky and fresh breeze east. Mr. Morin and two of his party arrived in camp at 4.20 a.m., in a used-up condition, and while he and party were partaking of a meal, I had a spare tent which was at caché put up and sleeping bags put in for them, I also detailed one of my men to look after them, and see their wants attended to.

I then made a small caché of supplies to take me to the ship on my return to Cape Providence. We then went about two miles inland where there was a musk ox lying, shot by some of the other party; we took two bags of meat and returned to camp. I then loaded one sleigh and got things in shape to leave in the morning for Mercy bay. I then decided to leave one man with Mr. McMillan and sent R. Goulet with him.

May 8.—Began fine and clear with light breeze easterly. Broke camp and left Cape Providence at 9.30 a.m. with two sleighs, the small one pulled by myself and Vigneault, quartermaster, contained five tins of biscuits and cooking outfit, and the larger one pulled by five men and our dog, Tom, contained tent, sleeping bags and surplus stores. We proceeded along shore till 12.30 and stopped for dinner, after which we travelled towards Cape Hay; our travelling is much impeded owing to a fall of new snow; camped at 5.30 p.m. Ther. showed 25 degrees minus to-day. Distance travelled, 12 miles.

May 9.—Broke camp at 8.30 a.m., fine and clear with light breeze east, travelled to Cape Hay and stopped for lunch, then went on again for 5 miles and camped for the night. Ther. showed 26

degrees minus. Distance travelled 11 miles. After supper I made a small caché of biscuits, spirit, cocoa and meat on a high beach and returned to camp at 8.45 p.m.; weather very thick and foggy.

May 10.—Began fine and clear with moderate breeze northeast; broke camp at 7.30 a.m., and travelled westward over rafted ice and heavy snowdrifts till 12.30, stopped for lunch and proceeded west by south till 5.30 p.m., and camped for the night, our sleighs have capsized many times. Ther. showed 14 degrees minus, a.m., p.m., 9 degrees. Distance travelled, 11.72 miles.

May 11.—Began fine and clear with light breeze east; broke camp at 8 a.m., and had fairly good travelling over some old ice pans, stopped for lunch at 12.30, then proceeded again till 5 p.m. This evening we had hard travelling, the snow being soft and very deep. Land sighted to-night for a short time only, owing to fog which hangs low on the land at night. Ther. showed 14 degrees minus. Distance travelled 12.50 miles.

May 12.—Began with strong gale northeast and drifting snow, which threatened to turn our tent over several times, we were obliged to lay close all day, at 8 p.m. it moderated a little and sky started to clear, at 10 p.m. broke camp and travelled till 2.30 a.m. with sails reefed and set on both sleighs; some places the snow is very soft, and the men sink to the hips, after having lunched we again proceeded till 9.30 a.m.

May 13.—The wind moderated and thick fog set in with a wet sleet falling, which soon wet the tent through and the water fell inside like rain, making our bags very uncomfortable and adding greatly to their weight. Ther. 28 degrees minus. Distance travelled 15 miles.

May 14.—Began fine with overcast sky and calm; broke camp at 8 p.m., and travelled over old ice and deep snow till 4 a.m., when thick fog set in making it impossible to see anything twenty feet ahead; the land was right ahead, but as I could not get any observation, I decided to camp until it clears up. Ther. 26 degrees minus. Distance travelled, 8 miles.

May 15.—Began fine and clear with light breeze west; broke camp at 1 p.m., and travelled till 6 p.m., stopped for lunch, the sky is now overcast and weather threatening, we continued to travel till 8 p.m., when strong breeze and drift compelled us to go into camp.

The ice travelled over was all old heavy arctic ice and the snow very deep. Ther. 18 degrees minus. Distance travelled, 8 miles.

May 16.—Began with fresh gale northwest and drifting snow, which turned to wet sleet in the afternoon. We had no chance to travel that day. Midnight a gale was still blowing. Ther. 22 degrees minus.

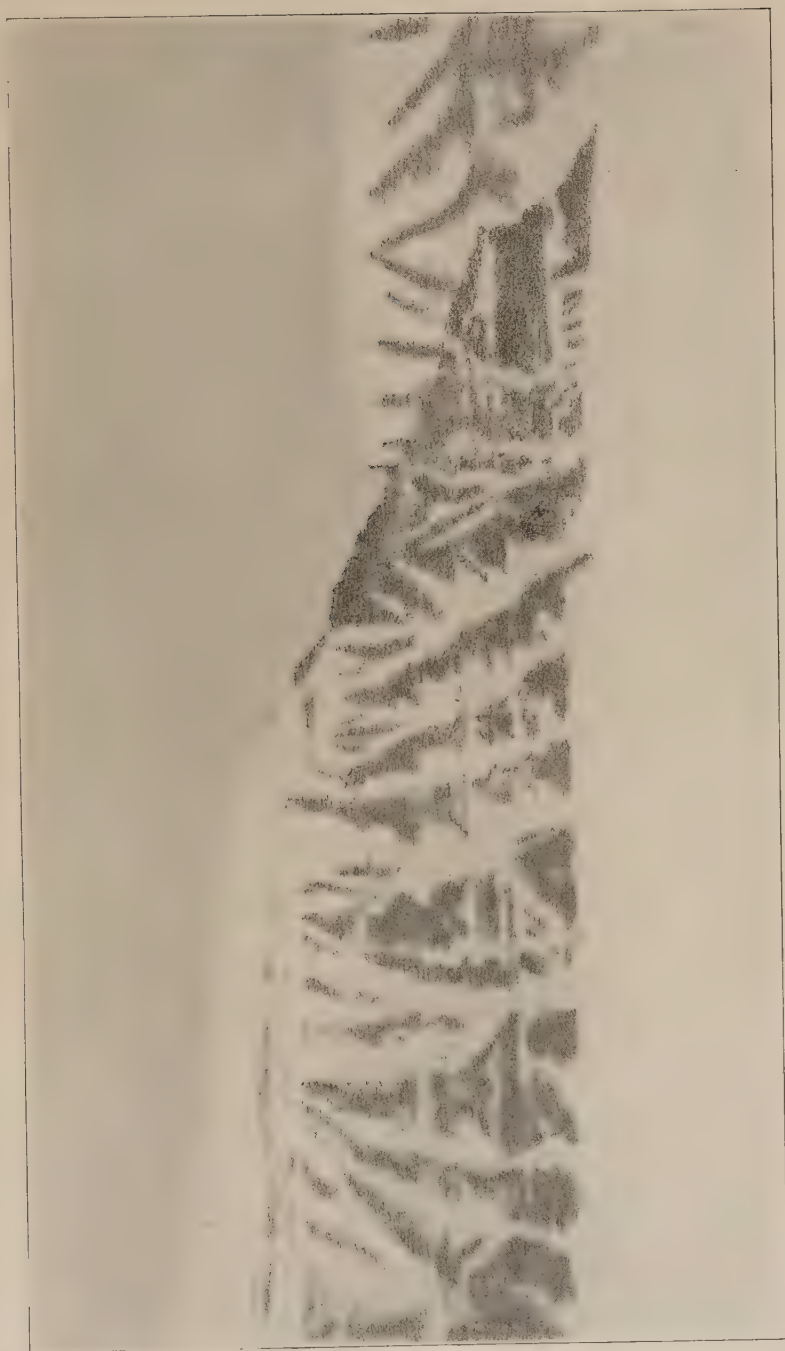
May 17, 4 p.m.—No change in wind or weather; we were compelled to remain in camp all through the day. At 7 p.m., the wind moderated, we got underway and we travelled till 4 a.m., over old ice and hummocks of deep snowdrifts, when the fog closed in again, and we were obliged to camp. Distance travelled 6 miles.

May 18.—At 11.30 the fog lifted and we loaded our sleighs and travelled towards the land, which is about 8 miles from us; all our bags and clothes are wet through, and the weight greatly increased. Burke and Johnson complaining of sore eyes and pains in their knees, I gave them pills and liniment which relieved them.

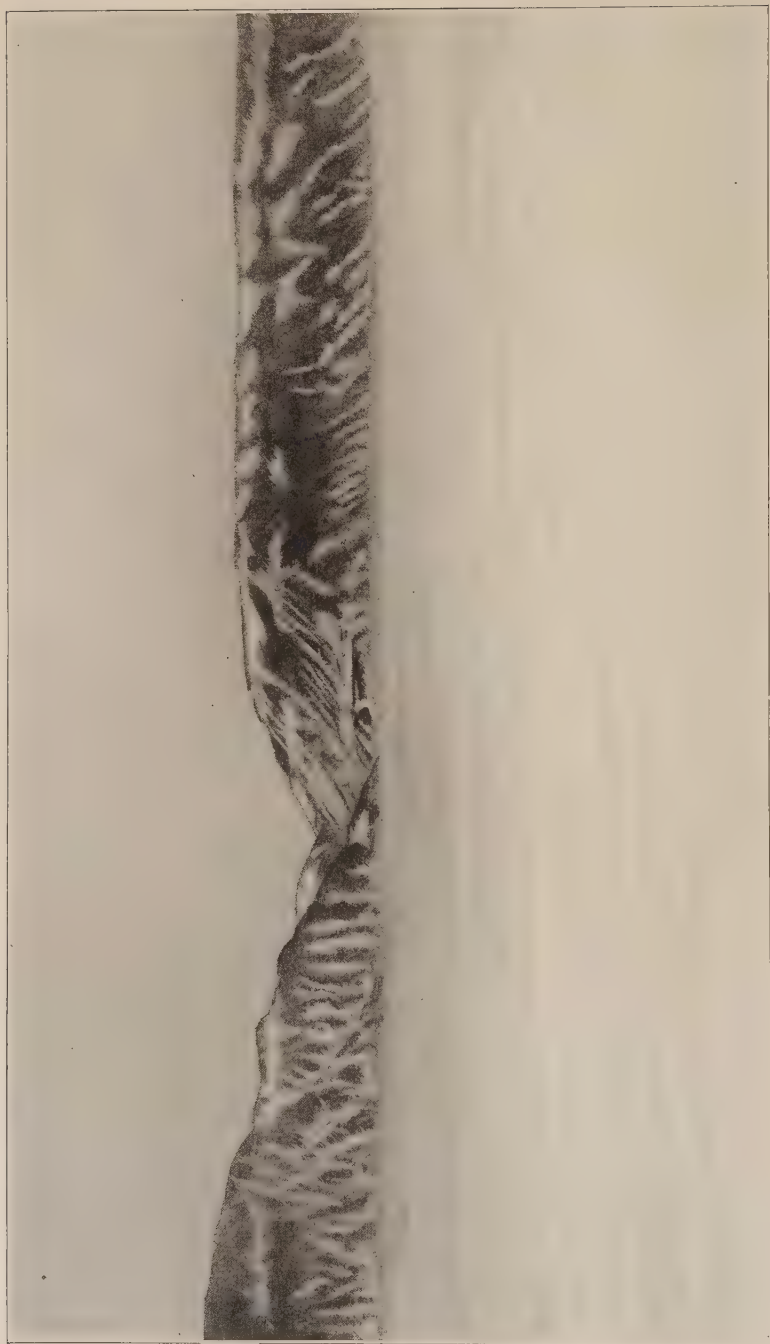
We continued to travel in a westerly direction till 4 p.m., when we stopped for lunch, the sun had not been visible for three days and only one reliable observation had been obtained since leaving Melville island. Six p.m. cleared up, and I made out Cape Saunders and Rood Head, for which I set my courses and travelled till midnight when we went to camp. Ther. a.m. 30 degrees minus, and p.m. 12 degrees minus. Distance travelled, 16 miles.

May 19.—Began fine and clear with light breeze west; broke camp at noon and travelled till 6 p.m., over old ice and deep snow; after having lunched we continued to travel till 11.30 p.m. and camped for the night. After supper I sent Vigneault and Dan Lane on shore to try and climb up the side ravine on the east side of Rood Head, where there is a large seam of coal visible and much loose coal scattered over the beach underneath. They returned at 2.30 a.m.; not being able to reach the seam, they brought some pieces from the beach which had broken off and fallen down from the seam. Ther. 5 degrees minus. Distance travelled 8 miles. The men had a hard job to get into their sleeping bags at night as the bags were frozen stiff and hard to handle.

May 20.—Began fine and clear with fresh breeze northwest; broke camp at 9.30 a.m. and had very hard travelling along shore, owing to the ice being rafted and hummocky and deep snow, which made it almost impossible to travel over. We stopped for lunch at



Coal Seam at a Height of 400 feet, 9 Miles East of Cape Hamilton, Banks Island.



Ravine, Bakus Island.

2 p.m., and I took some photographs of Rood Head; during our last camp our dog carried off all the meat we had, including twenty pounds of bear meat and buried it in the snow. I have decided to proceed to Mercy bay and finish my work there, take some provisions from caché and return to Rood Head. We continued to travel till 7 p.m. and camped for the night. Ther. a.m. 14 degrees minus, p.m. 5 degrees minus. Distance travelled 9 miles.

May 21.—Began fine and clear with light wind south; broke camp at 8.30 a.m. and travelled till 1 p.m., stopped for lunch, and went on again till 6.30 p.m., and camped 1 mile north of Cape Hamilton; five of the men were almost blind by night and had to bathe their eyes frequently. Myself and Dan Lane went on shore at 8 p.m. and climbed to the first ledge of Cape Hamilton, and after travelling for $1\frac{1}{2}$ miles, we found the ruins of a large cairn, also a pick-axe of ancient make, and stamped with broad arrow and name. From the condition this cairn was found in it was plain to be seen that some party had been there before and rifled it of any record that it may have contained; there were only two tiers of stones left that had not been removed. After examining those I went down on the west side of the Cape, where there is some 300 or 400 yards of beach, in hopes of finding a whale-boat and some stores which were supposed to have been left there, but not a trace of boat and stores was to be found. The land on the eastern side of the beach is very steep and is gradually breaking and disappearing into the sea. The Cape itself has got a peculiar appearance, as it consists of four broad ledges or shelves and is dome-shaped on the western end. From the second ledge up, the snow is very deep and appears to be of several years' accumulation. From this ledge a fine view of the Strait can be obtained, also Melville island from Cape Hay to Cape Aird. On my way back to camp I shot a large hare and a brace of ptarmigan, which were enjoyed at the camp as we had not had any meat for several days. We reached camp at 1.30 p.m.; ther. 28 degrees. Distance travelled during the day, 10 miles.

May 22.—Began with thick fog and calm, little snow falling, which cleared up at noon. We broke camp to travel for Point Back, which we reached at 6 p.m.; we stopped here and while the cooking was in progress I visited two more cairns which were erected on prominent points. No records were in them; I decided to caché my small sleigh and most of provisions and crossed to the west side of

the bay as light as possible; this was done and everything got ready for the morning. Ther. 34 degrees minus p.m. Distance travelled, 9 miles.

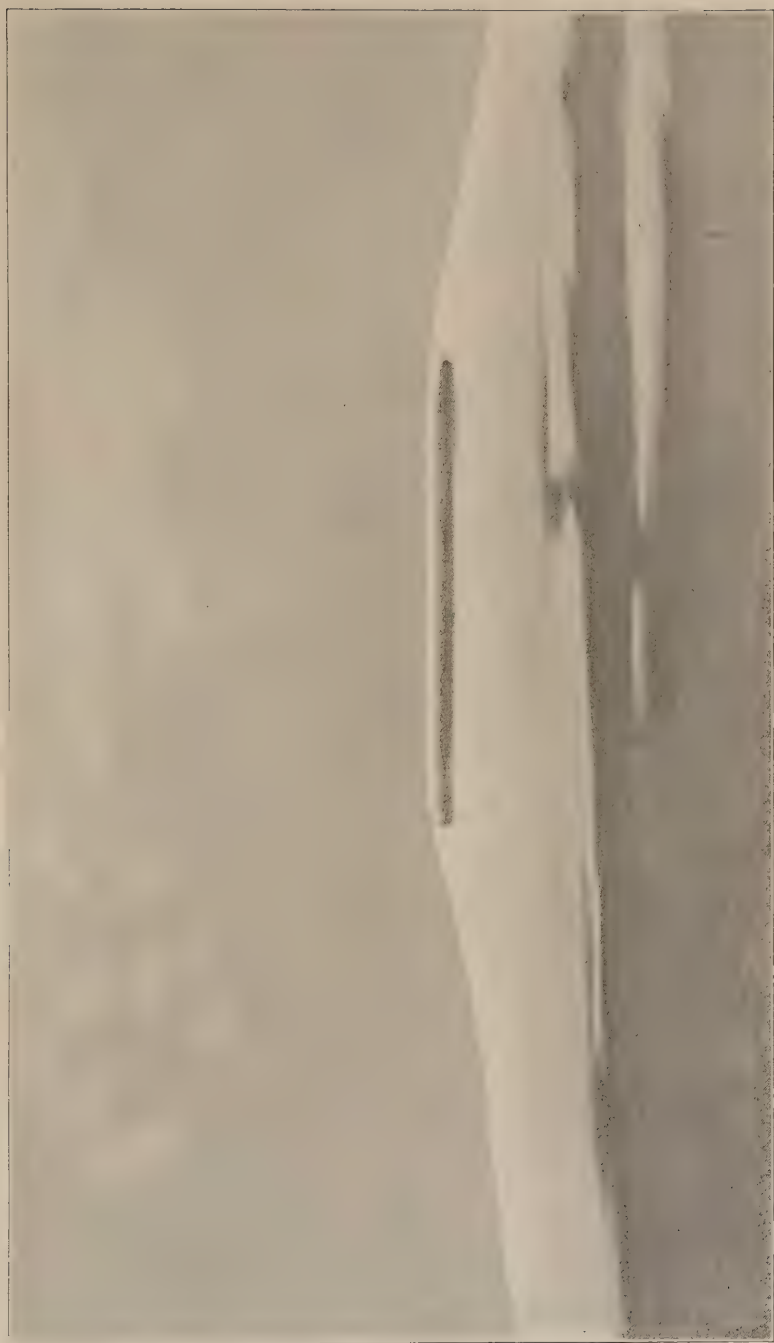
May 23.—Began with fresh breeze, easterly, light fog and drifting. Broke camp at 1.30 a.m. and travelled till 6.30 p.m. across Mercy bay. We then camped; after having a meal I sent Vigneault, Johnson and Burke to Point Providence to search for the cairn built by Captain Krabbie, while myself, White and Lane went on shore to look for caché. After travelling for four hours and not seeing anything, I returned to camp pretty nearly exhausted, as the snow on this side of the Bay is very deep and soft. I reached camp at 3.45 a.m., the other party did not get back to camp till 9 a.m., having travelled over and around Point Providence. No cairn or caché was found. If this cairn was built on the low part of the point of spit, it has been washed away by the sea which must break clean over the Point in bad weather.

May 24.—Began with gale northeast and drifting snow; we are forced to stay in camp all day till 11.30 p.m., when it moderated. We could afford to eat only two meals per day as our stock was getting low. We started to travel towards bottom of bay, and only made 2 miles when the wind veered to west and blew a fresh gale which compelled us to camp again till noon.

May 25.—We then travelled to within 5 miles of the bottom of Bay and camped; after supper myself, Vigneault and D. Lane went on shore and searched for traces of ship or caché, but did not find anything. Several deer were seen, but could not be approached to within shooting distance. We returned to camp tired out and low-spirited at 2 a.m.

May 26.—Broke camp at 3.45 p.m., strong breeze from the northwest, and drifting, and after eating the last of our pemmican and burning all the spirits to warm some bovril, we had to make a forced march to reach Point Back, where the remaining stores are cached. At midnight the wind took off and thick fog set in, but we continued to travel till 6 a.m. We reached the caché after travelling 18 miles. Burke and Johnson were almost blind during two days, but recovered.

May 27.—After giving the men a rest and a meal, I sent them to hunt, hoping to get a deer to help us on our way back, but only



Extinct Volcano near Back Point, Banks Island.



Extinct Volcano at the back of Back Point, Banks Island.

one hare was killed by Vigneault, and a couple of ptarmigan by myself, with which we returned to camp.

About a mile in from the point, we found the crater of an extinct volcano; iron ore being scattered in all directions in large quantities. I took a sample of ore and a photograph and returned to camp. I then got a cairn built and placed record inside, and at 8 p.m. left Back Point for Cape Hamilton, which we reached at 2.30 p.m., leaving the sleigh on the ice with two of the men. Myself and remainder of the party went up to the cairn and removed all the stones, but found nothing under them. We then built a cairn and I placed a record within and took a photograph of same, and returned to sleigh. I intended going to Rood Head again from here, but my provision being now reduced to 50 pounds of biscuits, $17\frac{1}{2}$ pounds of pemmican, 8 pounds of bovril, 5 pounds of tea, 3 pounds of sugar, and $4\frac{1}{2}$ gallons of spirits. I leave here for Melville island on the 28th.

May 28.—Began with fresh breeze west and dull clouded sky. Broke camp at 7.30 p.m., and travelled till midnight and stopped for lunch, which consisted of two biscuits per man and some bovril. We then went on again till 6 a.m., when a strong gale sprung up with drifting snow. We go into camp, having travelled 15.50 miles. Ther. 16 degrees minus.

May 29.—Thick overcast sky, broke camp at midnight and travelled till 4.30 a.m., stopped for lunch and went on again till 7 a.m., all hands were getting played out; our pemmican was finished and only one tin of biscuits was remaining, with a little bovril and tea. As our dog was beginning to feel pretty hungry and snapped at any one going near him, I shot him and cooked the best of him, and all hands made a hearty meal of the meat. I then considered the best way to lighten the load; our sleeping bags being wet through, and four of them frozen too hard for the men to get into them, I ordered them to be discarded, taking only the covers and blankets; I then cut my skin bag into two pieces, Vigneault and Johnson also cut theirs and gave each of the others a piece of skin to lie on, we then loaded our sleigh and travelled till 2 p.m.

May 30.—Weather was thick and foggy and snowdrifts 10 to 12 feet high had to be pulled over; some of the men complained of being sick. 5.30 p.m., I went into camp, having travelled 14 miles. Ther. 12 degrees minus.

May 31.—Began with light breeze southeast and hazy overcast sky. Broke camp at 4.30 a.m. and travelled till 11 a.m., when we stopped for lunch; we could only afford six biscuits per man daily with a little bovril and tea. We started again at noon, and travelled till 3 p.m., and camped having travelled 15 miles over young ice covered with snow and drifts. Ther. 12 to 13 degrees minus.

June 1.—Began with strong gale east-northeast. Had breakfast at 3.30 a.m., but a drifting sleet prevented us from travelling till noon, when the wind moderated. We then started and travelled till 4 p.m., when we stopped for lunch and then proceeded till 9.30 p.m., when we went into camp for the night. The Boatswain Johnson complained of his knee being badly swollen and stiff. On examining it, I found that he had struck his knee cap against the edge of the ice by falling into a crack. The distance travelled, 14 miles. Ther. 12 degrees minus.

June 2.—Began with strong breeze and clear sky which freshened to moderate gale and blew our tent over at 3.20 a.m. We got underway at 11.30 a.m., and we travelled 5 miles when the wind freshened to strong gale and compelled us to seek shelter under the lee side of an iceberg, where we got our tent into position.

Our biscuits were now reduced to three per man daily with bovril and tea. We were now about 8 miles from the land, but the weather was too thick to see anything, so we had to remain in camp till 8 a.m. The wind moderated, and we travelled till noon. The wind veered to west, and we were getting on good ice. The weather was clear and we continued to travel towards Cape Dundas till 9.30 p.m., when we camped 2 miles west from it. We had travelled 20 miles this day, and the men said that they could go no further. Robinson had been blind all day and had to be guided by a drag rope. White's feet were very sore and swollen and gave him much pain. Burke and Johnson complained of pains in their knees, so I gave them the last of the Menard's liniment remaining, to rub themselves with.

June 3.—Fine clear weather, broke camp at 5.30 a.m. and travelled till noon over a lot of bad pinnacle ice and deep snow, the men were very much fatigued, and we had to take a two hours' rest. We had only enough biscuits and dust to make one meal, so I persuaded them to start again and travel till 5.30 p.m. and camp on the east side of Dundas. After eating our supper of broken biscuits and dust, which we boiled with two tins of milk taken from medi-

cine box, myself, Vigneault and Lane started for our small caché which I had made when leaving for Banks island. We reached it at 11.30 p.m. to find Mr. bear had got there ahead of us, and had destroyed our bag of fresh meat, 40 pounds, leaving only a few small pieces, however, the biscuits, $\frac{3}{4}$ tin, cocoa, 2 pounds, and $\frac{1}{2}$ gallon of spirits were all right. We packed them on our back and started for the camp; we did not reach it till 7.30 a.m.

June 4.—The two men and myself had travelled 28 miles during the last twenty-four hours. After partaking a good meal, the first for several days, we rested till 1 p.m., and travelled towards Cape Hay, which we reached at 8.30 p.m. Here we stopped to take lunch, and rested for one and a half hours, the weather being thick and threatening. I pushed on for Cape Providence, stopping for lunch only as a fresh breeze from west-northwest relieved us from pulling in the harness. We set out large sail, and as the ice was free from snow, the sleigh ran easy and the men took turns riding. We thus continued till 2.15 a.m., when we again stopped for lunch of biscuits and tea, after which we proceeded till the depot was reached at 8 a.m.

June 5.—Here we were met by Mr. Koenig, chief engineer, and Mr. George Lessard, who were in charge of the station, and who gave myself and the men all the necessaries they could for our comfort. The men, not taking the advice I gave them, ate too ravisly of the food given them and were very sick.

June 7.—Fine and clear with light breeze north; yesterday the 6th being Sunday, the men rested and were feeling better in the evening. Some of them are bad with dysentery, and have to take several doses of chlorodine to relieve them.

All hands in the morning turned to fixing up sleigh, &c., but White being too sick to work, and his feet being badly swoollen, I sent him to bed. The boatswain also complained of diarrhœa and pains in his leg. Vigneault's eyes were sore, he having broken his glasses. We finished work at 3 p.m., and were ready to leave for the ship in the morning.

June 8.—Began with strong breeze west-northwest and overcast sky with frequent snow squalls, at noon, moderate breeze and sky clearing, we left depot for the ship, taking spare sleigh and all surplus stores remaining at caché, we travelled till 5 p.m.; when passing over a crack in the ice, the boatswain fell through, and got



Second Officer Charles W. Green, returning from Victoria Island.

a wetting which caused us to put our tent up and get supper ready while he was shifting his clothes. After supper we continued to travel till midnight, when Point Clarence was reached and we camped till noon.

June 9.—Weather fine and clear, we travelled towards Phipp's Point, which we reached at 1.15 a.m. on the 10th, and camped on the shore. Several herds of musk oxen were seen grazing on the plains, but as the men were all tired out we did not disturb them.

June 10.—Broke camp at seven thirty (7.30) a.m. and travelled till noon. We stopped for dinner and then went on again till we reached Hearne point, and received help from the ship, which was reached at 4.15 p.m., and we were received by Commander Bernier, and the men were attended to by the ship's surgeon.

CONCLUSION.

While travelling in and around Mercy bay, I found ancient traces of Esquimaux at Point Back and at the bottom of the bay; rings of stones showed where they had camped, also bones of seals and deer lay strewn about. My opinion is that the *Investigator* is now lying on the bottom of Mercy bay, and all the cachés and cairns have been rifled by whalers.

CHARLES W. GREEN,

Officer in charge of the expedition.

June 20, 1909.

Taking Angles and Amplitudes.

June 12 was a fine day, and we took a round of angles from the stern of the ship in line with all the beacons. Bearings were taken of all the different points, commencing at Cape Bounty and continuing with Reef point, Northeast hill, North hill, Northwest beacon, West beacon, Parry's rock, Vanasse point and Hearne point, and we also took bearings of all the flagstuffs which we had placed in the ice where we had taken soundings; these bearings were taken for the purpose of making a chart of the inner and outer harbour. The bearings were taken several times at different times of the day; the morning and evening observations being more accurate than midday observations. We took amplitudes for variation on different days at three times a day, namely, morning, noon and after-



Completion of Cross on North East Hill, near Winter Harbour, Melville Island.

noon, and found the variation to vary from 103 to 98 degrees east, which we could not account for, the wind being from different quarters and the sun being brighter and stronger sometimes than at other times. The different degrees of temperature during the different hours of the day, no doubt, was the cause. The meteorologist, who took his observations on shore, found the same conditions, although his instruments were superior to the instruments of the ship. We changed the compass to different places, and put it on ice pillars, and found the same result, therefore there could be no difference from attraction.

Spring at Melville Island.

June 13 was a beautiful warm, clear day, and the effect of the warmth of the sun was noticeable everywhere; water had accumulated on the ice from melted snow, and the winds from a southerly direction had set in. We went on this day, in the afternoon, to Northeast hill, where a cross had been erected, to commemorate by a praise service our safe sojourn at Winter harbour during the long season of short days, total absence of the sun, cold and storms, at which twenty-one of the ship's company were present.

The next day, we had a strong wind from the southwest, but it was fine and clear. The musk oxen were beginning to appear again in numbers, the spring vegetation causing them to roam from one place to another. Three large musk ox bulls were seen about 3 miles to the northward of the ship; two of them were killed by myself and Mr. Frank Hennessey and one by Tremblay, a seaman. The animals were skinned, dressed and taken on board; the meat was good and tender, but with very much less fat than the meat secured in the fall. The skins were poor, as the animals were shedding their coats, which work off gradually.

The fine weather tempted the men to wander from the ship with guns late at night, but this was dangerous as they were liable to attack from prowling animals; in fact, one had been attacked by a bear. Feeling the responsibility for the safety of the crew, I deemed it in their interests to stop the practice. Not only was it dangerous to leave the ship on account of wild

animals, but danger arose from the undermining of snow in ravines that presented a safe looking surface.

Cutting a Canal in the Ice.

The thickness of ice even in June was so great in the harbour that no hope could be entertained of leaving without cutting a canal wide enough for the vessel to pass out. I anticipated this work, and caused the ashes from the ship to be placed upon the ice along the line of the proposed canal. The sun's heat was absorbed by the ashes, and they materially assisted by melting the ice, and the labour of cutting was very much lessened.

On June 17, we had a partial eclipse of the sun; the contact took place at 10 hrs. 57 m. 10 s. Greenwich mean time; middle, 12 hrs. 03 m. 30s.; the end, 13 hrs. 00 m. 30s. With our glass, I could see three black spots on the sun. Mr. Jackson and Mr. McMillan took observations at their tent.

On June 18, the chief officer and eight men went to Hearne point to build a large beacon at the entrance of the harbour from the outside.

The Midnight Sun.

On Monday, June 21, the chief officer was engaged taking compass bearings and azimuths at different hours of the day for variation. The result differed from previous observations, but this can be accounted for by scientific men. The midnight sun was supposed to be at its highest elevation, and it was a grand sight to witness the orb at its highest point in the heavens at midnight. The effect upon the men was somewhat wonderful and was similar to my own feelings. The sun infuses more life, causing men to feel younger and possess more energy for work or travelling.

We had killed during this day some musk oxen, and left them to be taken on board, which was done on the 22nd. The total weight of the carcasses when dressed was 908 pounds, and the meat of splendid quality as the animals had at that season plenty of fresh grass and moss for food.



Taking Observations on Parry Rock, Winter Harbour.

Plan of the Harbour.

I had determined to make a plan of the harbour for the benefit of mariners, and with the chief officer and a quartermaster took bearings from different bases. The plan is embodied in this report with other plans. At the same time that we were engaged in taking bearings, Mr. Vanasse and two quartermasters were sent out to build a cairn on Point St. Clair, one of the leading points of the harbour.

CHAPTER VIII.

Return of Mr. Morin from Banks Island.

Second Officer Morin and his party, returned from his second trip to Banks island at this time, and accompanying him was Chief Engineer Van Koenig and Quartermaster Lessard, who had been during the absence of Mr. Morin stationed at Cape Providence, for the purpose of making general observations respecting the climate and ice movements in the Strait. They had also in charge a cache of supplies for the sleigh expeditions to and from Banks island and Victoria island in case of need. The return of the two parties to the ship, created on board, quite a pleasant change from the usual monotonous daily round of life. The relation of the occurrences and experience of the men that had been away and the information brought back, formed new topics of conversation.

The report of Mr. Morin upon his second trip is here inserted, and shows that his expedition was more satisfactory than the first, from the fact that he left a record of the annexing of Banks island and Victoria island, now under the jurisdiction of Canada.

Expedition to Banksland, May 17, 1909.

J. E. BERNIER, Esq.,

Commander of the Expedition of C.G.S. *Arctic*.

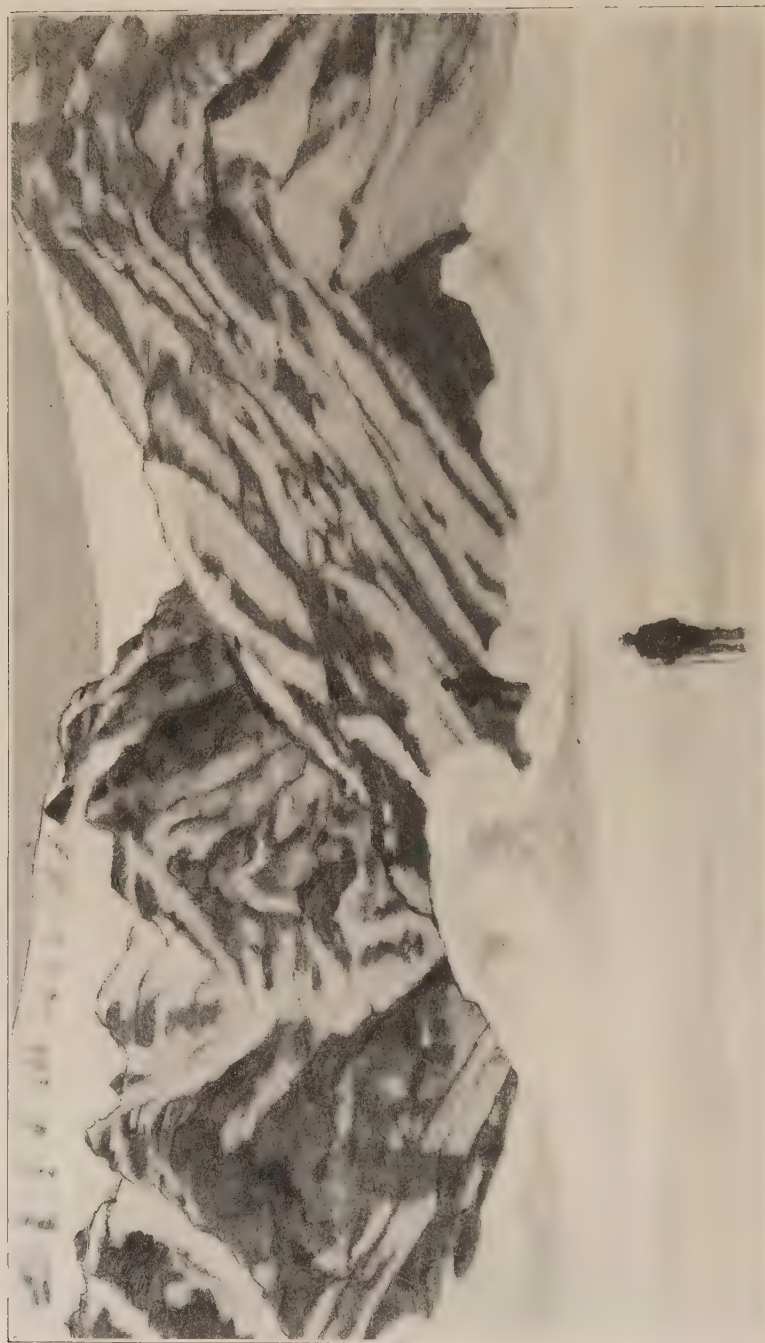
SIR,—In accordance with your orders of May last, 1909, I have explored the north coast of Banks island, with a view of finding the veins of coal that Doctor Hamilton claims he discovered in 1853. I proceeded as far as Mercy bay where I spent a few days, and found remains of coal from the deposit left there by McClure in 1853.

The expedition was composed of four men, Guillaume Lebel, A. B., William Doyle, A. B., Reuben Pike, and myself. Our equipment consisted of one sledge on which was packed supplies for a forty days' journey. The expedition left the winter quarters of the C. G. S. *Arctic* on Monday, May 17, 1909, at 9.30 a.m., taking a

land route in a direction south of Parry rock as far as Musk-ox bay. We camped for night at 5 p.m. after covering a distance of $8\frac{1}{2}$ miles. Engineer John Van Koenig, with his party who had started out for Cape Providence to gather up the provisions left in the caché there in the fall of the previous year, was with us. On the following morning, the 18th, we resumed our march to Cape Providence and reached the caché, which was $3\frac{1}{2}$ miles east of Cape Providence, on the night of the 20th. We spent the day of the 21st making the last preparations, and to complete our supply, get a boat into shape, and helped Engineer Van Koenig to pack up what was left at this caché in order to remove it to the ship. Van Koenig and Lessard had instructions to station at this point till I returned from my expedition. On May 22 at 5.30 a.m. I started out with my party for Banks island following a course along the southwest coast of Melville island. It was blowing hard and snow was falling. I ordered the sail to be set on the sledge and we all took places on board and set off. The wind carried us along at a speed of about $6\frac{1}{2}$ miles an hour, on fine smooth ice clear of snow, and after a run of two and a half hours we covered, under these favourable conditions, a distance of 16 miles. It was now 9 o'clock a.m. and a dense fog prevailed, and the wind had gone down, so we had to put into camp for the rest of the day and following night. We were now located 2 miles west of Cape Hay. On the morning of the 23rd we resumed our journey. Now we had to haul our sledge as the wind failed us. We travelled under very favourable ice conditions till May 27, on which date I sighted Banks island. We now stood at a distance of 28 miles from it. This last distance we experienced to be the hardest tramp yet of the journey, owing to the unfavourable condition of the ice and persistent bad weather. We covered this distance and reached Banks island on June 2 at 5 p.m. We set camp for the night on the ice at about 300 yards from the shore. We made an observation and now stood exactly at a point, D. R. latitude north $74:03$ and $116:50$ longitude west. At this point the coast has an elevation of from 600 to 700 feet above the level of the sea. The formation is sand and stone. After supper I set out to make the ascension of the hills, by way of a ravine, as it was impossible to reach the top through any other road, as the hillsides are very steep, being almost perpendicular. The ravine through which I climbed ran in a southwesterly direction and the grades were quite sharp. After walking about three-



Bernier Bluff, Banks Island.



Ravine, Banks Island.

quarters of an hour the surface became easier and I soon reached the summit.

The bed of the ravine is gravel, and it may be observed that at springtime at the melting of the snow, a stream of about 2 feet runs down through it. The formation on these hills varies and is sand, gravel, and of a reddish shale rock. The surface of Banks island on the heights is level, and an abundant vegetation of moss can be observed. Deer trails could be seen here, in a southerly direction. The land is elevated in flats, in the shape of terraces or steps. At the foot of each a small ravine is to be noticed, through which water runs, some in a southwest direction and some in a southeast direction. The hill overlooking our camp is, as stated, cut almost perpendicularly, and is a beautiful point for observation and the surroundings are to be seen at a great distance. I have named this elevation 'Mount Bernier,' in honour of the Commanding Officer of the cruise of the C. G. S. *Arctic*. A beautiful and extensive view of the Strait can be obtained from this point. We found at the foot of this hill a heavy ice shove extending in an easterly direction for a distance as far as could be seen.

June 3, we left camp at 5 a.m. and forced our march on in a westerly direction, following always the coast of Banks island. After covering a distance of about 1 mile we found ourselves on a very picturesque level strip of ice running through heavy packed ice on each side. This flat had a width of from 500 to 600 feet. This view reminded us of the road on the Quebec battery. Its shape and elevation presented much the same aspect. The hills on Banks island here still run high over the sea-level, and from our position presents also a very interesting view, the many elevations present the appearance of a military citadel, on which the various arrangements of ice piles would appear to be as many forts erected. Ravines are to be found at about every mile or mile and a half. We made a careful examination of the formation at the bottom of each. In one ravine between Mount Bernier and Cape Rodd, I found a few pieces of coal, which, according to my observations, have been carried down from the hills by spring water, as at the elevation I found them it would have been impossible for this coal to have been washed ashore from the sea. Most of the ravines that we have explored are very narrow, we found one, nevertheless, having a width of about 200 feet, this was the second one discovered from Mount Bernier. We

found a stream of crystal-like water running through this ravine, which was excellent drinking water. We took advantage there to take a good supply of it. On the ice and on the coast everywhere we noticed, all about, polar bears' paths. We explored a fourth ravine at about 6 miles west of Mount Bernier and about 3 miles east of Cape Rodd. The bed of this ravine is some 50 feet wide. The bed and shores are about 200 feet wide. No water was running then. Very fine sand and gravel was the formation we found here. Towards the sea it was running in a southwesterly direction till it reached about half a mile from its mouth, when the course changed to a true south direction. Numerous small lumps of coal can be seen on the shores, the dimensions of which vary from one square inch to three or four.

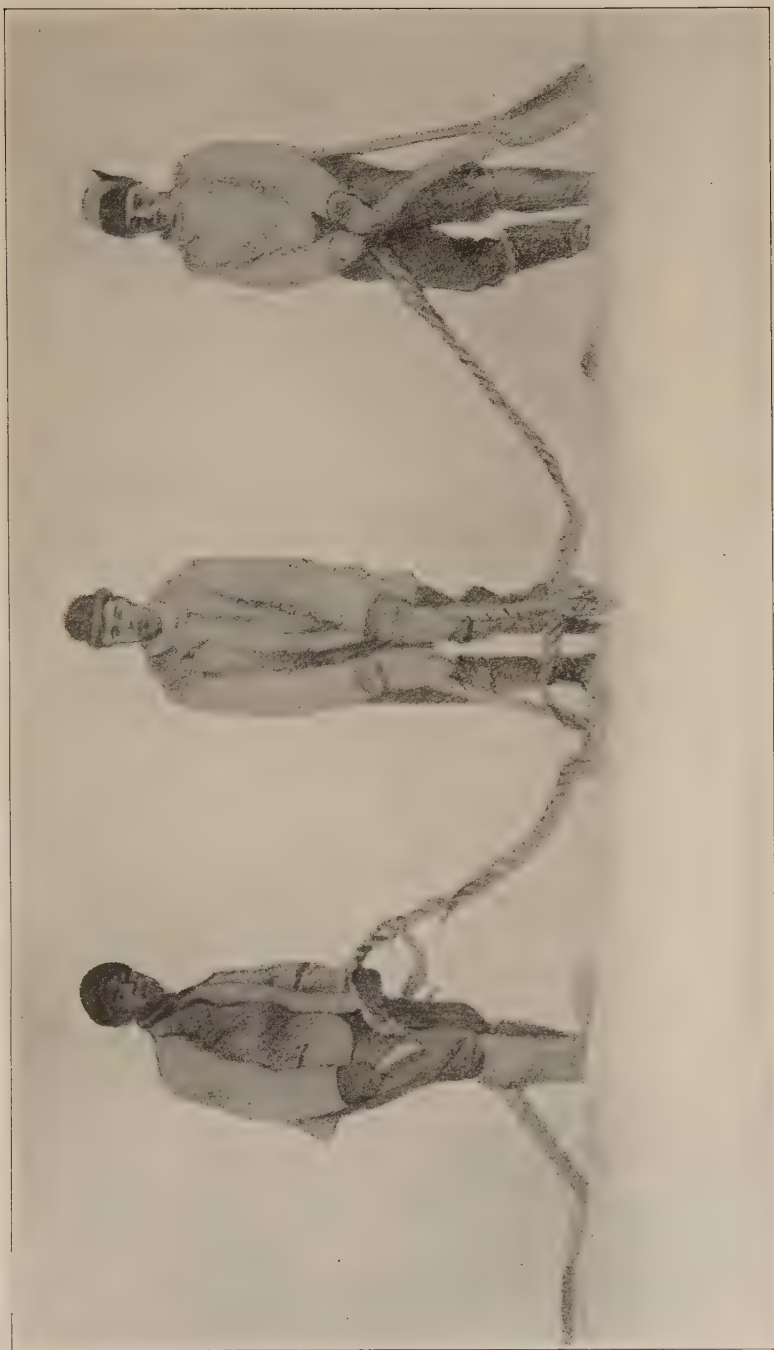
I explored this ravine to about three-quarters of a mile from its mouth and discovered two small veins of coal on the hillsides at an altitude of about 200 feet, and located within a short distance one from the other. They penetrate the hillsides in a southwesterly direction. I extracted a few pieces of coal from these veins, and observed that it was a very hard, bright, and black coal, being as brittle as glass and when broken made no dust. At the mouth of this ravine a peculiar stone stands erect and would remind one of a huge tombstone. It stands some 50 feet high, at the bottom of the hills, and by its location can be observed from a far distance at sea. This stone projects from a rock, and as it spreads out its thickness is gradually reduced for about one-fourth of its length, then it has a uniform thickness of about 12 inches, with a table-head on of from 7 to 8 feet wide. This rock is of a reddish colour and eight green veins run through it in all directions; it has a perfectly polished surface, which could not be improved by skillful workmanship. I gave the name of Vanasse to this ravine in honour of Mr. Fabien Vanasse, our historian. Throughout this ravine there are indications of the place being visited by animals, polar bears, deer, foxes, wolves and rabbits could be observed, and at this place gulls and ptarmigan and other birds of the arctic regions could be seen. The ice shove at the mouth of the ravine is very extensive, and but for some 40 feet would reach the stone monument I have described. This ice shove extends here on a width of about 100 hundred feet, and the strip of clear ice that I have previously mentioned extends all the way from Mount Bernier to Cape Rodd, where we arrived at 2



Ice Pressure, Banks Island.

p.m. on June 3. From here we explored the coast and hills in a westerly direction with a view of discovering the coal vein reported by Lieutenant Creswell of the *Investigator*. In climbing the hills at an elevation of about 400 feet, a flat about 30 feet wide is noticed and looks like an immense gallery all along the hill. From the base to the top of the hill an examination was made and no coal vein could be located. In another ravine somewhat east of Cape Rodd, more pieces of coal were to be found at the mouth. This ravine is very wide and deep. We camped for the night opposite Cape Rodd, and during the night we had a call from a polar bear, that retreated in haste when he heard the report of our rifle. We were too tired to follow him on the trail, though he must not have travelled far, judging by the trace of blood that could be seen in the direction he moved, in his retreat.

On June 4, we resumed our tramp towards Cape Hamilton, a distance of 11 miles west of Cape Rodd. All along the route coal can be found on the flats as well as in the ravines. By four o'clock we found the trail on which Mr. Green and party had travelled with their sledge, at about 4 or 5 miles from Cape Hamilton on the east side. Between Cape Hamilton and the route over which Mr. Green had travelled we observed that the ice there was several years old, and closely pressed to the shores. This ice is pressed over a distance of fifteen miles on the Strait. Numerous bear trails can be seen all through this district. Shortly after four o'clock we camped in sight of Cape Hamilton, at a distance of about $3\frac{1}{2}$ miles from this very massive and imposing cape. The next morning at 8 o'clock I mounted by way of a ravine to the top of the hills and saw deer. Pasturage of moss here is plentiful and is mostly bare of snow. From the sea the hills rise higher by large steps like terraces, and numerous ravines may be observed. At this point of observation I could see Point Providence and Mercy bay. At 12, noon, I was back at camp and after dinner we resumed our journey towards Cape Hamilton, following all the way the trail over which Mr. Green and his party travelled. My object in calling at Cape Hamilton was to obtain information of Mr. Green and to leave a record of my expedition. At three o'clock we found ourselves opposite the Cape. I could easily find there the cairn erected by Lieutenant Court. Mr. Green had visited it on May 26, 1909, and had left a record there. I read it over and noticed that Mr. Green made no mention of having



Remains of rope found in McClure's depot, Bay of Mercy, Banks Island.

visited Mercy bay. I decided to go there, where I visited the cairn and left a record. On the morning of June 6 we again resumed our march towards Point Providence, which we reached the same night at six o'clock. During the evening I made a search for the cairn erected by the expedition of McClure in 1853. We found on the site of this cairn but a few rocks scattered around on the sand, and that was all that was left of the monument erected by Sir Robert Lemesurier McClure on Point Providence.

We left on June 7, at 7 o'clock in the morning. We marched on towards the interior of the bay, and following the coast we found at first smooth, young ice. A very dense fog prevailed then. At ten o'clock we reached very old ice. This was evidence that this part of the bay had not seen open water in many years. This ice is smooth, and covers about two-thirds of the entire surface of the bay. From what observations I made of the ice here, I am led to believe that the bay had open water at the mouth during last autumn. At 11 o'clock we had reached the depot. We could still see there the coal left by McClure. There is still there about six tons of coal. With this all that can be seen of the large deposit that was made by the crew of the *Investigator* in 1853, were pieces of sails, pieces of old ropes, and debris of packing materials. We could not locate the cemetery, where were buried three members of the crew of the *Investigator*, nor could we find any trace of Mr. Green's passage at this caché. Nothing could be found of the records left by McClure; everything has disappeared. As to the ship *Investigator*, it sank in the bay or has drifted away. No trace of her can be seen. We then proceeded to the far interior of the bay, a distance of several miles, to McClure's caché. At four p.m. we were in camp at about 2 miles from the far interior of the bay, on the ice on the west side of the bay. Early on the 8th we walked to the interior of the bay, where we erected our tent for the day. The land here is elevated by a series of plateau, separated by ravines. The grade is easy, and forms good moss pasturage. Great disturbances must have taken place in this part of the country in centuries past. The volcano at Point Back can be seen from here, and must have been the cause of this strange and noticeable disturbance of the hills. During the day Pike and Doyle made a hunting trip into the interior, and killed two deer, from which we got a good supply of fresh meat for the return journey, that we were about to undertake. During the

day I, with Lebel, made observations of the formation of the hills, and found mountains of limestone, separated by ravines. The east coast of Mercy bay is much higher than the west coast.

On June 9, at 7 a.m. we started on a visit to the point where a cairn was erected when the *Investigator* had wintered there from 1851 to 1853. We halted at the depot at 11.30 a.m. Our search resulted in not finding there anything at all. It was as fruitless as the previous one. The cairn was located on a small beach, and had been demolished. No records were to be found. We rebuilt the cairn, and in erecting the flag, using the barrel of our rifle for a staff, I officially took possession of Banks island, in the name of Canada, and left a record of the trip, wrapped up in the folds of the flag, which was deposited in the cairn.

On June 10, we started on our return journey towards Cape Providence and Melville island, where we arrived safely on June 20 at 2 a.m. without any other hardship than that caused by the quantity of water on the ice, and the inability, owing to the number of our party, to undertake the trip by a water course. From June 12 to the end of the journey we were forced to walk up to our knees in the cold water, and often found it even deeper. On the morning of the 21st we met Messrs. Van Koenig and Lessard at the caché, and at midnight we all left for the headquarters of the *Arctic*, which we reached on the 24th at 5 a.m.

I beg to report that I have communicated the tenor of the following letter, as instructed by you, during the course of the voyage, to my companions.

O. J. MORIN,
Second Officer.

C. G. S. *Arctic*,
Winter Harbour, August 8, 1909.

ANNEXED LETTER.

C. G. S. *Arctic*,
Winter Harbour, April 3, 1909.

Mr. O. J. MORIN,
Second Officer.

DEAR SIR,—As soon as you land on Banksland, please head this letter to the men of your party.



Arrival of Second Officer Morn from Banks Island. Showing kind of Sleigh used.

If you are satisfied with the men under your command, I hereby authorize you to promise to the parties who landed on Banksland and Victoria island, the sum of ten dollars (\$10) gratuity.

It must be well understood that the gratuity from me is only valid when they have landed on Banksland and Victoria island, and have taken possession of the same, and have been of good behaviour.

Wishing you and your men a safe return to the *Arctic*,

I remain yours truly,

J. E. BERNIER,
Commanding Officer.

On board C. G. S. *Arctic*,
August 8, 1909.

SIR,—I am glad to say that my companions have well earned the reward promised them, as per your kind letter of April 3, 1909, and trust that it will be an easy matter for you to have their claim recognized by the Honourable Minister of Marine and Fisheries.

Respectfully submitted,

O. J. MORIN,
Second Officer.

J. E. BERNIER,
Commanding Officer,
C. G. S. *Arctic*.

Cape Providence, Melville Island.

The report of Chief Engineer Van Koenig contains information of an important nature respecting the physical features of Cape Providence and the surrounding part of Melville island and the climate. It will be seen that the spring, at Cape Providence only about 35 nautical miles distant from the winter quarters of our ship, was much in advance of Winter harbour. The report is brief, but contains valuable information respecting the southwest part of Melville island; for this reason, I have deemed it important to insert the report in full.

CANADIAN GOVERNMENT STEAMER *Arctic*,
WINTER HARBOUR, MELVILLE ISLAND,

July 31, 1909.

To Captain J. E. BERNIER,

Commander of the C. G. S. *Arctic*,

By Royal Commission.

SIR,—I have the honour to report on my trip to the caché, $3\frac{1}{2}$ miles east of Cape Providence, which was in my charge during Mr. Morin's and Mr. Green's trip to Banksland and return.

I left the ship on May 17, travelling with Mr. Morin, as far as the caché, where we arrived on the evening of the 20th.

On the 21st, I took an inventory of the caché and fixed up the camp; I also helped the men to get the boat, which was at the caché during the winter, ready to bring back to the ship, and sent back a surplus of provisions, as per orders.

May 22.—Mr. Morin and his party left Banksland at 5 a.m., with a fair wind. One of the men shot a white wolf. The weather was very windy and the snow was drifting.

May 23.—There was a moderate breeze from the west. Mr. Mc-Millan, who was staying with us, Goulet, and the men in charge of the boat, left at 11.15 a.m., going eastward, with a fair wind and the sails set on the boat. From this date I was left alone with Joseph Lessard, quartermaster. We shot one hare and seven partridges, and we saw four musk oxen and several partridges.

May 24.—The day was cold and clear, with a heavy breeze from the north, we expected the tent to blow down at any minute. The wind fell during the afternoon but blew stronger again towards night.

May 25.—It was fine and clear, the heat of the sun being felt in the afternoon. We went about 4 miles inland towards the north, bringing back one hare, and also seeing a live fox and two musk oxen, about two miles from the tent. We felt it much colder during the night.

May 26.—The weather was cloudy and cold. We went towards Cape Providence, about in line with the Cape, but out on the ice. We saw a seal, and on returning, when about a quarter of a mile east of Cape Providence, we shot and skinned a musk ox, cleaned the meat, piled it up, and covered it with the skin. We reached the

tent at 8.30 p.m. The heat from the sun was quite strong towards evening.

May 27.—This was a cloudy day, with a moderate breeze from the northeast. It got calm towards noon, but remained cloudy. Lessard went out but did not see anything. We made a fire in tins, using musk ox fat, which burns very well, for fuel. We saw several partridges and birds, but were too far away to get them.

May 28.—It was clear and cold, and a strong breeze was blowing from the northwest. We went to the westward, looking for cairns, but did not see any; on our way back we saw another live fox. We went out on the ice, in the evening, to see if anybody was coming.

The 29th was cloudy, with a moderate breeze from the west. We went out to the westward in the morning, and in the afternoon we went inland three miles, towards the northeast, and came back on the ice. On our way we shot two rabbits and one ptarmigan.

May 30.—The weather was cloudy and there was a light breeze from the north. We went to have a look round the tent on the hill, and also on the ice, but could not see anything on account of the fog. To-day, for fuel, we used bears grease, which worked well, giving good heat, but also smoking very much. I might say here that we were making trials of the fat of different animals, as fuel for cooking purposes, by way of experiments.

May 31.—It snowed and drifted all night, with a moderate breeze from the northeast and fog, making everything wet and uncomfortable around the tent. Storm increased during the day, until at 8 p.m., both of us were busy trying to keep the tent down. We had supper very late, expecting to spend a bad night on account of the wind.

June 1.—It was still blowing very strong from the north, with snow drifting so that we could not see anything outside of the tent. We did not venture to go out, expecting the tent to go any minute. In the afternoon, we could hear the owls whooping, but could not see them, it being as bad as in the forenoon. The wind kept steady all the evening.

June 2.—At 12.30 a.m., the wind went down a little. We saw a herd of musk oxen, about two miles east, but it was too stormy to go out. We went about 7 a.m., a mile from the tent, where we shot at a musk ox and wounded him, but our guns broke down. The shell of the cartridge broke in the barrel of Lessard's gun, and the spring

of the magazine in mine also broke, so we had to return to the tent for repairs.

June 3.—The day was fine and clear, without any wind. To-day we went out about a mile and a half to the northward, where we saw the musk ox we had wounded on the previous day. We also saw forty more coming up the shore. We found a pile of rocks, which at a distance looked like a cairn, but on examining them we found they were much too heavy to have been moved. Coming back, we shot four ptarmigan, and saw the first flock of Brant geese this season. In the evening we went about two miles out towards Cape Providence. We shot two partridges and saw a few musk oxen.

The 4th was also fine and clear. We went out to finish our wounded musk ox; we killed and skinned it, cleaning the meat, and bringing back the heart and liver, with a few pounds of meat.

June 5.—The weather was clear, with moderate breeze from the west. Mr. Green and his party arrived from Mercy bay at 7 a.m. All his party were in good condition, but pretty hungry. I gave them the following provisions:—1 tin of biscuits, 1 tin of pemmican, 7 pound of bacon, 7 pounds of fresh pork. I also sent a hind quarter of musk ox meat to the tent. I gave Mr. Green the spare sleeping bag, which was at the caché, and kept him with us in our tent.

June 6.—The day was cloudy, and there was a strong breeze from the northwest. We had to move our tent about 3 a.m. to the beach, where we got everything settled, and turned in again at 5.30 a.m. I gave a few small items of provisions to Mr. Green and his party to-day.

June 7.—It was fine and clear. Mr. Green sent some of his men to bring the meat of the musk ox we had shot, down to the tent, where they packed it to take with them on their way to the ship. I also gave Mr. Green the following provisions from the caché:—4 pounds biscuits, 4 pounds pemmican, 90 pounds beans, 2 rolls Bologna sausage, 1 20-pound box of ham, 1 pound tobacco, 2 pounds butter, and a few tins of fish and potatoes. I also gave him a rabbit and seven partridges which we had shot, and the sleigh from the caché, to be taken to the ship, as per orders.

June 8.—The day was cloudy, with snow flurries, and a moderate breeze from the northwest. Mr. Green spent the forenoon getting

ready to start out. He and his party left the caché at 2 p.m., going fine with sails set. The wind was steady all day.

June 9.—The weather was fine and clear, but windy from the northwest. We went about 4 miles inland to the northeast, where we saw some ducks in the ponds. We also saw a number of sparrows, but no big game.

June 10.—The weather was clear, with a light breeze⁺ from the southwest. We went about 4 miles inland towards the northwest, finding plenty of snow. Coming back, we shot a large musk ox, about half a mile from the tent, bringing in the two hind-quarters and all the meat we could take off the fore-quarters. As the skin was out of season, we left it there.

June 11.—The weather was fine, clear, and perfectly calm. It was the first calm day since our arrival. In the evening we went to Cape Providence. We did not go to the cairn, as it had recently been fixed by Mr. Morin and Mr. Green. Coming back, we brought the skin of the musk ox we had killed on May 26.

The 12th was fine and overcast. We went out eastward of the cache, looking for ducks, but did not see any.

June 13.—It was fine during the morning, but raining in the afternoon. There was plenty of water round the camp from the thawing snow. Lessard went out hunting seal, but had to return on account of there being too much water on the ice. It was very foggy in the evening.

June 14.—The weather was fine and calm, being the warmest day we had. We moved our tent to drier ground, putting it on the sand. During the afternoon, a breeze sprang up from the southwest, getting much stronger towards evening.

June 15.—We had clear weather, with a strong breeze from the northwest. The wind shifted from the southwest during the night. In the afternoon we went towards Cape Providence. When we were about half a mile from the Cape, it commenced to snow, then it stopped snowing and became very foggy. We managed to get back to the tent by following the land, although we could not see the tent 20 feet away.

The 16th was cloudy, with a moderate breeze from the northeast. We left at 5.30 p.m. for Cape Providence, went two miles west of the Cape, as far as the second ravine, where we shot six rabbits. We then went up on the highest hill to see if we could see Mr.

Morin and his party, whom we were expecting any day from Banksland. We got back to the camp about midnight.

The 17th was fine and clear. The wind got up about 4.30 a.m., and blew strong from the northeast. We stayed in camp, looking out at times to see if the party was coming.

June 18.—It was fine and clear but windy. I was detained in camp by a sore knee. Lessard went out, and reported that he had shot a seal, but that it had sunk.

The 19th was cloudy, with a light breeze. We worked round camp in the forenoon. Light snow fell in the afternoon. There was a moderate breeze from the southwest. We went out about three miles on the beach to the east of the caché, returning on the ice. We did not see anything.

June 20.—The weather was cloudy, with snow squalls. Mr. Morin and his party arrived from Banksland at 2.30 a.m., all being in good condition, and enjoying the best of health. We started to pack up our stock, getting everything ready by 6 p.m.

The 21st was fine and clear with strong sunshine. We started to load the sleighs at 1 a.m., when we could feel the heat from the sun. We left the caché at 2 a.m., with six hands, all told. We kept going till 5.30 a.m., and we started again at 7 a.m. We passed Cape Clarendon about 12, and at 12.30 a.m. we came inland to camp. Then we had dinner and turned in. The road was very wet, we walked in from 4 to 13 inches of water right along.

June 22.—It was fine and clear, with bright sunshine, and a light breeze from the north. We started at 3 a.m., passing through very bad ice and plenty of water. We camped at Cape Phipps at 7.30, had lunch, and started again at 9 a.m. We went about 5 miles east of Cape Phipps, where we had dinner and dried our clothes.

June 23.—The day was fine and clear, with bright sunshine. We left camp at 1.30 a.m. The road was fine and clear of water. We camped at 4.45, had lunch, and started again at 6.30, camped again at 10 p.m. about 4 miles west of the ship, on Hearne point.

June 24.—The day was fine and clear, and there was no wind. We left camp at 1 a.m., passed Hearne point at 2 a.m., arriving at the ship at 4 a.m. The commander came out half a mile from the ship to meet us. Everybody was in good health, having had a very successful trip.

I beg to submit the following remarks on the state of the ice, &c., for your own information.

I found the season to be much more advanced at Cape Providence, both on the ice and the land, than at Winter Harbour. We could see that the ice was melting pretty well on the first of June. There was quite a lot of water by the 10th, but I think the ravines which were running in places, from 3 to 4 feet deep, had a good effect on the ice. About a mile to the westward of the caché there was quite a large cataract. A few days before leaving Cape Providence, I noticed several cracks, which were open, and seemed to be widening, running in width from 2 to 6 feet, and running out as far as one could see.

The land is rather broken for a distance of about 4 miles from the shore, when you come to a large plateau which extends as far as you can see with the glass, and is well covered with snow. The shore was at that time perfectly free from snow. From the beginning of June the musk oxen seemed to be all heading in the direction of the plateau, and coming from the eastward. We saw them in herds, varying in number from sixteen to forty. The skin seems to be of little use after the end of May, except the wool, which comes off freely. In some places we could pick up quite a lot on the ground. Mostly all the musk ox skeletons we found were lying on the shore, the bones being, in most cases, still intact. Lessard found four skeletons at one time, all within less than a quarter of a mile.

Seal seem to be more plentiful at the Cape than at Winter Harbour. On fine days we could see as many as twenty in a group. They stay about a mile or a mile and a half from the beach. But in the ice pressures there are lots of holes where they seem to have been in the winter. But it is very hard to approach them, their hearing being so sharp, and the ice so level.

We saw no deer during our stay. Rabbits are numerous around Cape Providence. Partridge were plentiful when we first arrived, but by June 1 we could not see any. We saw Brant geese for the first time on June 3rd, but after that we saw them right along. Sparrows were plentiful, chirping around the tent at night.

Our outfit was completely satisfactory, the sleeping bags being very comfortable. The methylated spirit stoves worked very well, using only $3\frac{1}{2}$ gallons during the whole time we were there. We

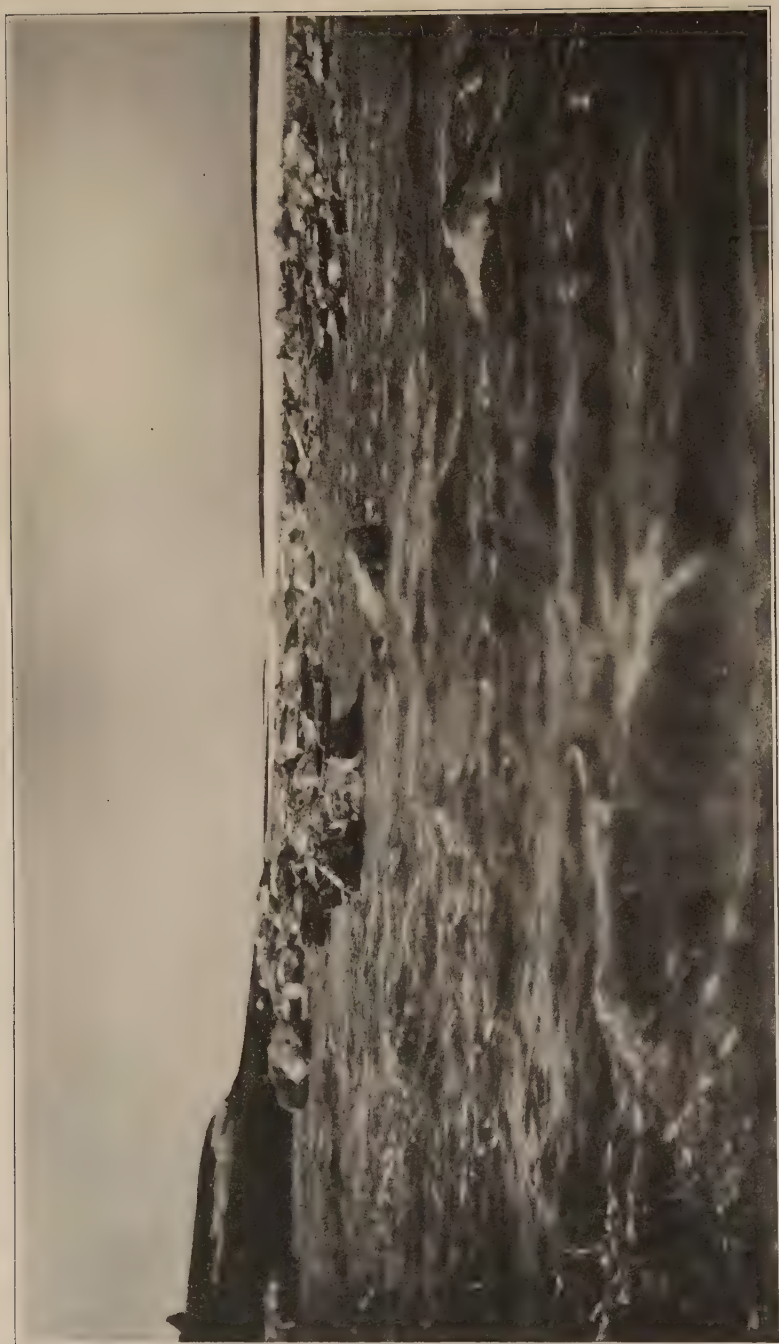
used bear and musk ox grease a couple of times as experiments, but not because it was needed. Bear and musk ox grease can be used with good results if burnt in a tin to prevent its running out, and kept soaked in a handful of waste. It gives plenty of heat, and it does not take much to cook a good meal; the only disadvantage being the smoke. I think it could be used to advantage as fuel here in the fall when the animals are fat.

I have the honour to be, Sir,

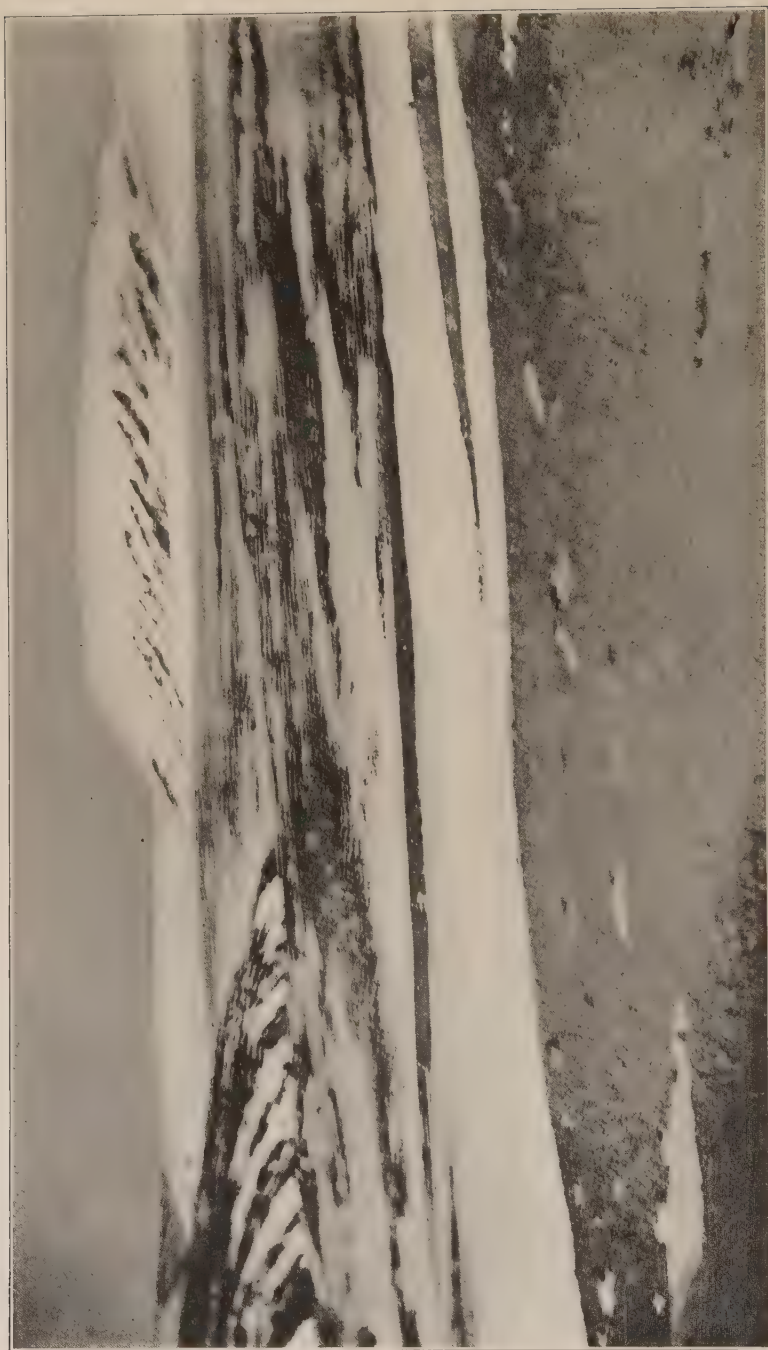
Your obedient servant,

JOHN VAN KOENIG,

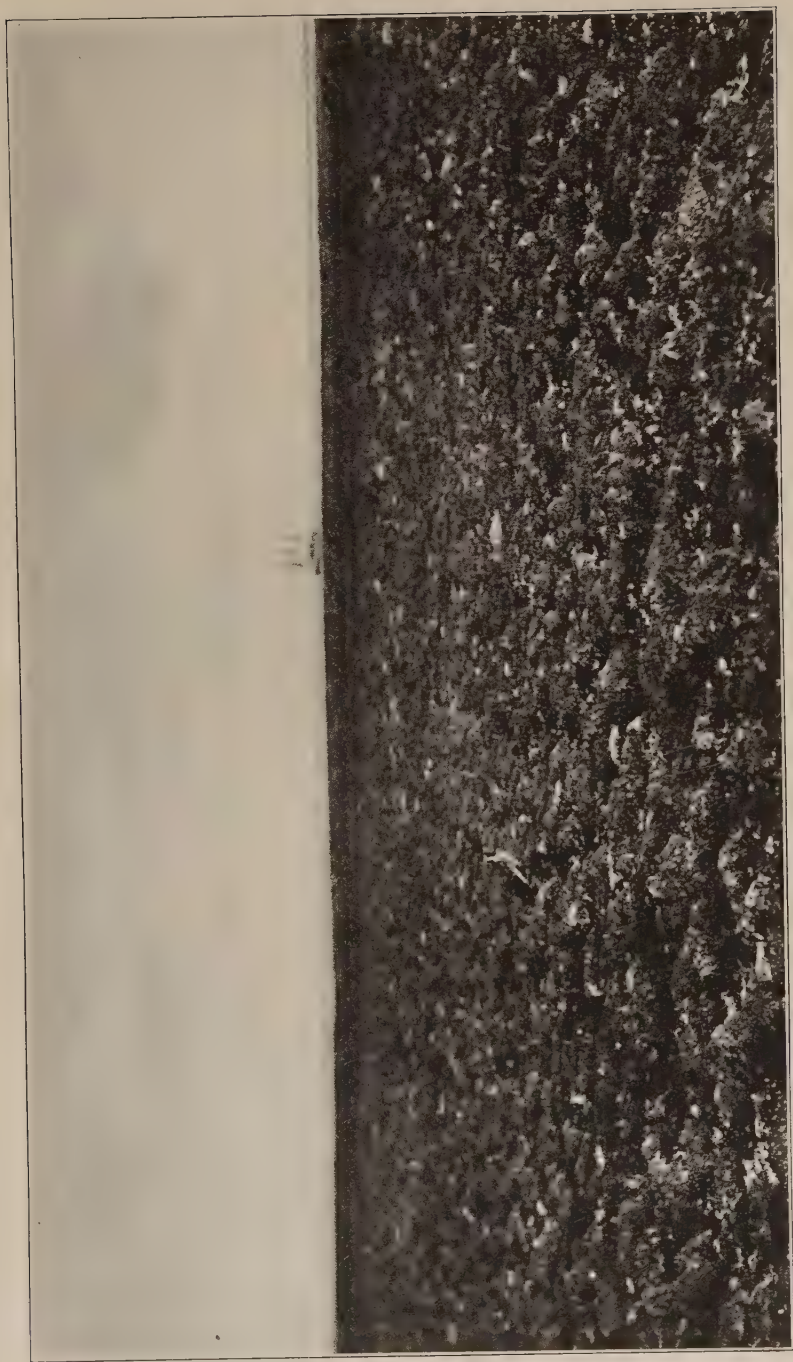
Chief Engineer.



Discharge of stream in Winter Harbour, 1909.



Snow Banks in Ravine in Winter Harbour in Spring of 1909.



Flowers and Vegetation, at Winter Harbour.



Jaeger Feeding Young Birds.



King-Eider Ducks, Male and Female.

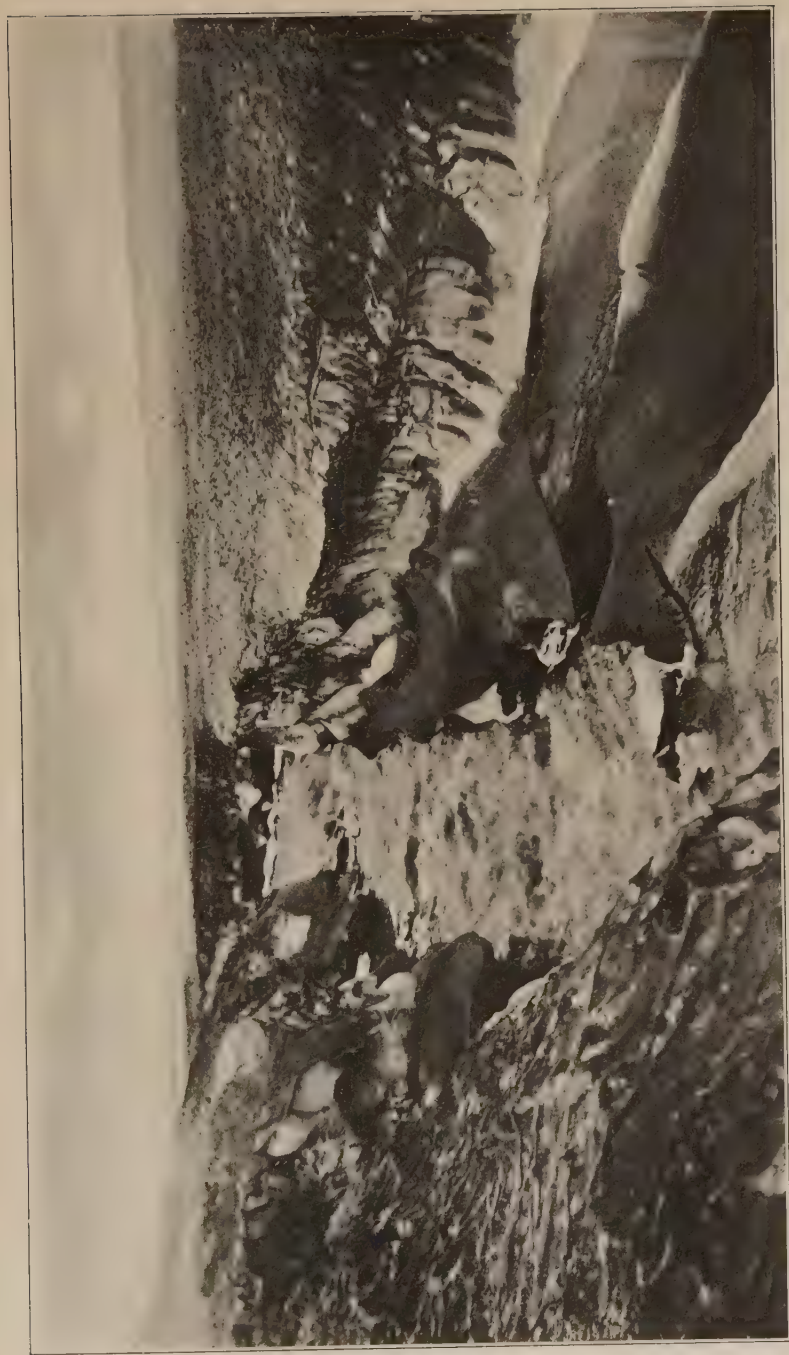
CHAPTER IX.

July First, Dominion Day.

The latter part of June brought many changes in our surroundings. The pasturage for deer had become abundant; the sound of running water from the ravines, the welcome effect of the sun's rays in the large and numerous pools of surface water upon the ice in the harbour, were all evidences of a near approach to our liberation, from the icebound position in which our ship had been for many months. Deer were seen peacefully feeding at a short distance, and paying no more attention to our ship than if she had been some natural object; eider ducks were seen in our vicinity, and we had the good fortune to shoot several.

Dominion day was celebrated by all on board; all our flags were flying, and the day itself was all that could be desired. At dinner we drank a toast to the Dominion and the Premier of Canada; then all assembled around Parry's rock to witness the unveiling of a tablet placed on the rock, commemorating the annexing of the whole of the Arctic archipelago. I briefly referred to the important event in connection with the granting to Canada, by the Imperial Government, on September 1, 1880, all the British territory in the northern waters of the continent of America and Arctic ocean, from 60 degrees west longitude to 141 degrees west longitude, and as far north as 90 degrees north latitude. That we had annexed a number of islands one by one and a large area of territory by landing, that we now claimed all islands and territory within the degrees 141 and 60 west longitude as Canadian territory, and now under Canadian jurisdiction. Three cheers were given in honour of the Premier and Minister of Marine and Fisheries of Canada, and the men dispersed for the balance of the day to enjoy themselves. Most of them engaged in picking wild flowers, which grew in abundance, and securing objects of interest.

During the first week of July, the men were employed in taking off the deck housing and stowing it in the hold for



Ravine in Spring, Winter Harbour, Melville Island.

future use, if necessary. We now began to consider the question of remaining north during another year, and with this in view, measured our burning oil and ascertained that more than half of our original supply had been consumed, therefore, it was necessary to be careful if our voyage was to be prolonged. We built cairns at several points; one named the western cairn, surmounted by three barrels, was 10 feet at the base and $7\frac{1}{2}$ feet high. Commander Parry's cairn on Northeast hill, was rebuilt and a copper plate with the names of the ship *Hecla* and *Griper*, 1819-20, inscribed on it, to indicate where Parry left his records, was placed on a piece of oak abreast of the cairn. Another cairn, about 10 feet high, was built at Fife point, in which records were placed of our observations and transactions.

The crew was employed taking the boats and sledges from the shore into the ship. The thickness of ice was 5 feet 6 inches, but very much honeycombed under water. We had rain on July 3—quite a change to us from the snow which formed the usual precipitation. On the 4th, we sighted seals on the ice outside the tidal crack.

We were now able to use our boats around the shore at high tide as the head of the harbour was clear of ice to low water mark. Deer were plentiful, and five were killed on July 4, weighing 700 pounds when dressed; the skins, however, were useless at that season; about thirty more were seen on the 9th, but having plenty of fresh meat, no attempt was made to kill them.

Searching for Coal.

The search for coal had been kept up, and a report of a discovery by Quartermaster Vigneau induced me to try and locate the deposit, but I found loose coal only, which had been carried to the spot by ice or water; our search did not result in finding a seam or deposit of any kind. In this, I may here state, I was very much disappointed. Coal lying on the surface leads one to expect that a deposit is near by and will be found by diligent search, but after one's hopes have been raised almost to a pitch of confidence, nothing can be more disappointing than a fruitless search, which forces one to the conclusion, that

This Memorial,

is

Erected today to Commemorate,
The taking possession for the
"DOMINION OF CANADA,"

of the whole

"ARCTIC ARCHIPELAGO,"

Lying to the north of America
from long. 60° w. to 141° w.

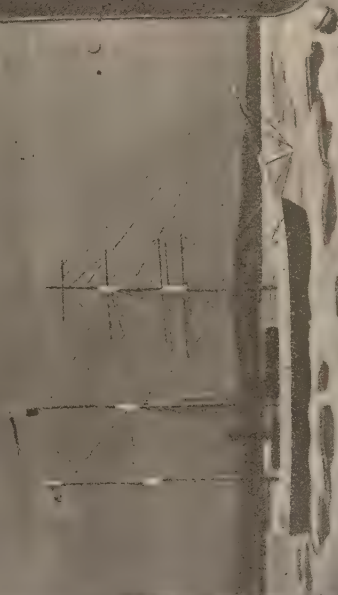
up to latitude 90° n.

Winter Hbr. Melville Island.

CGS Arctic, July, 1st 1908.

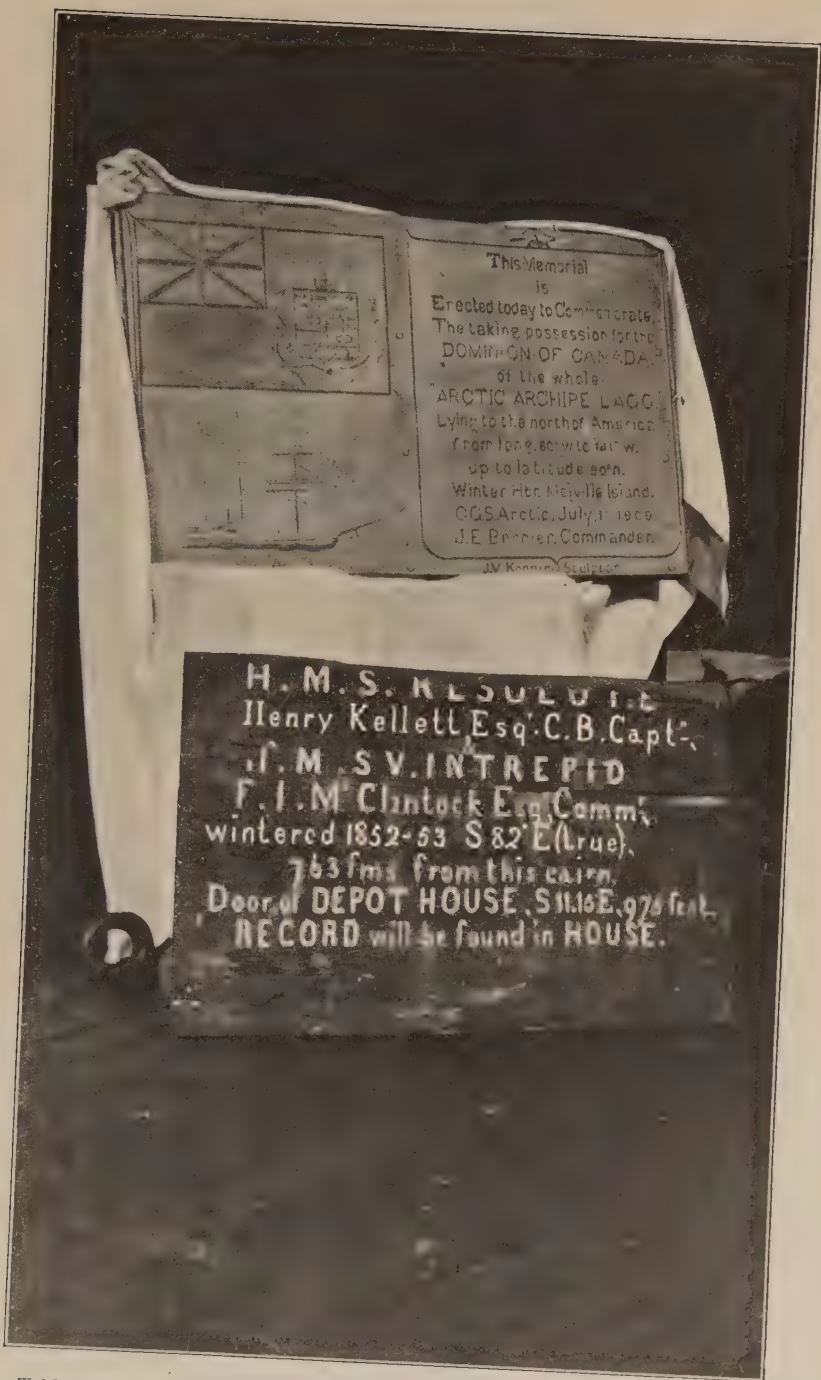
J. E. Bernier, Commander.

J. V. Koenig, Sculptor.





Tablet left on Parry's Rock, Winter Harbour, July 1st, 1909, by Captain J. E. Bernier.
hand. Officers and Crew of the "Arctic." Young Musk Ox licking Commander's



Tablet erected on Dealy Island by Captain Kellett and Commander McClintock, in 1852-3, whose vessels were lost. This Tablet was found by Commander Bernier, and re-erected with his own Tablet on Parry's Rock, commemorating annexing of the Arctic Archipelago in 1909.

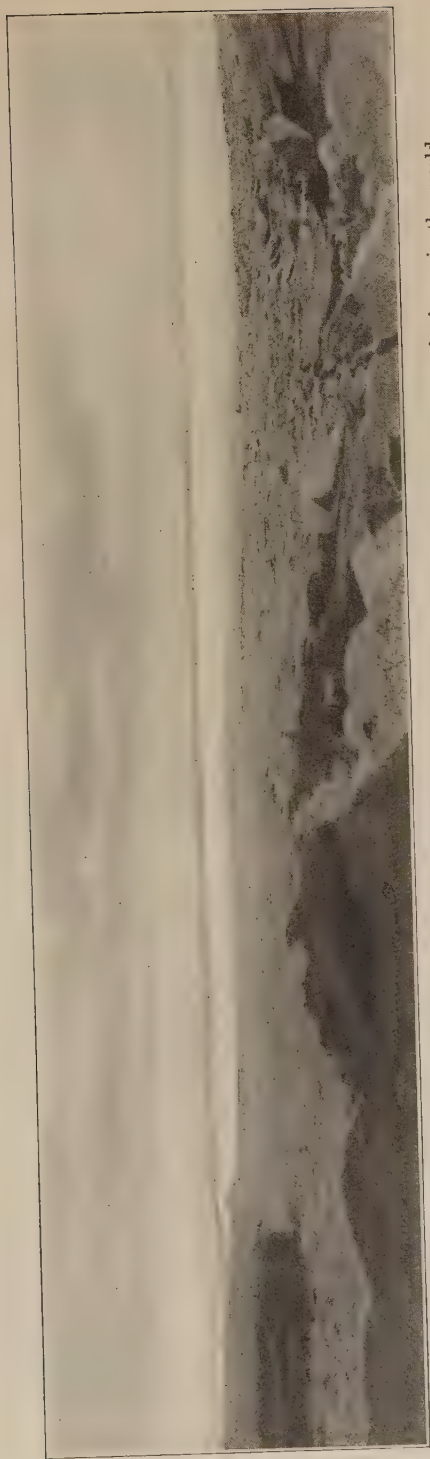
the signs have been misleading. Another lot of surface coal which resembled cannel coal in appearance, was found a few days later by myself and Mr. Vanasse on Reef point, and coal of the same kind was found by Mr. Vanasse near Northeast hill.

The fine weather, at this season, enabled us to accomplish a great deal towards collecting specimens of various kinds, and to pursue work which the cold and stormy weather did not permit. We took a round of angles from Parry's observatory for proof of our former observations.

On July 9, five men and myself built a cairn at Fife point, 10 feet high, where a record of our transactions was left. We took a photograph of the cairn and also of Fife point harbour. This harbour can only be entered by small vessels.

The ice outside Winter harbour, was quickly melting from the effect of water on the top, and at this time measured 4 feet in thickness, but inside the harbour at the crack it was 5 feet thick. Most of the snow had disappeared from the ice and the shore. On July 12, we bent our square sails and were otherwise engaged making ready for our departure from Winter harbour.

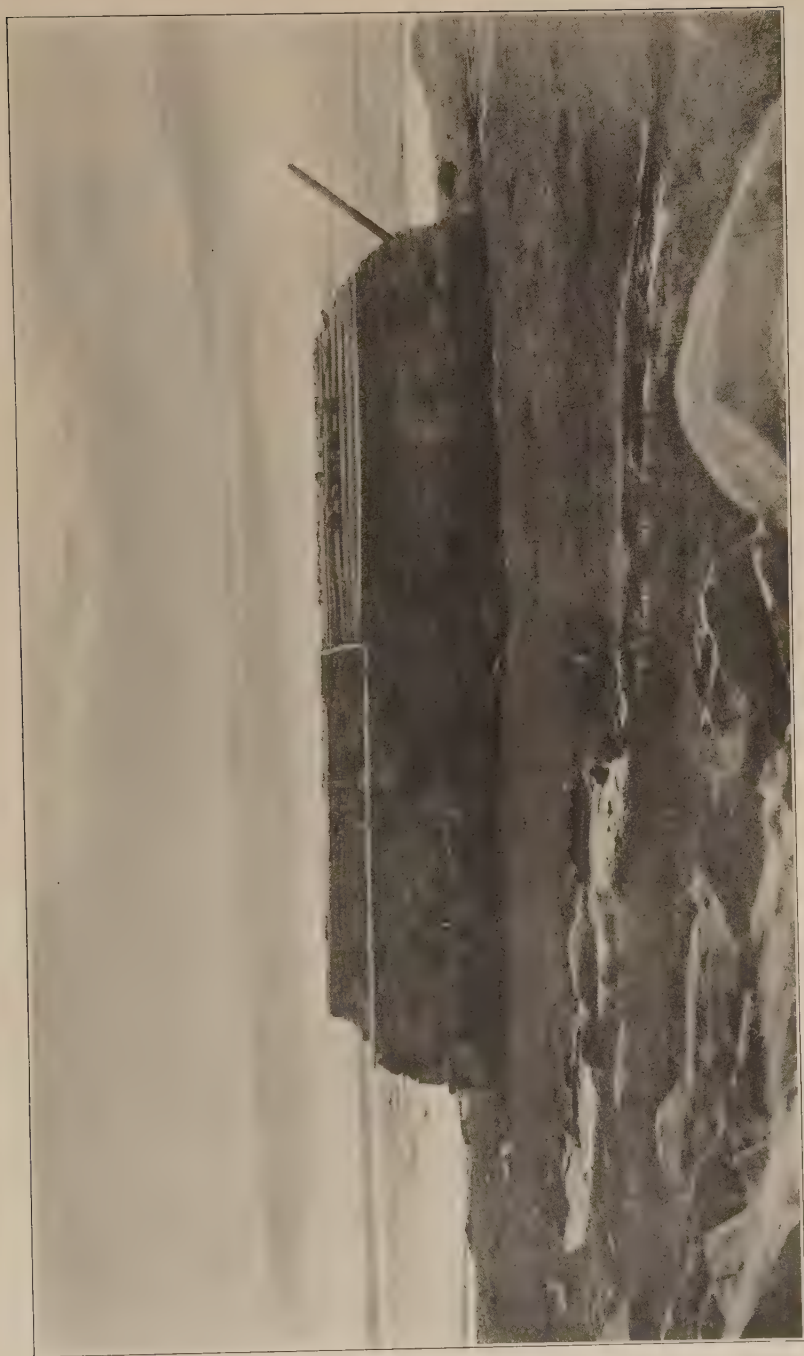
The second officer and five men were selected to go to Dealy island to repair the cache at that place, and deposit records there; to build cairns at Wakeham point, Halse point, and Cape Bounty, and also place records in them. With one seaman, I went on shore to continue the search for coal. The surface of Melville island is loose, caused by the action of frost and the weather; our search, however, was not more successful than previous efforts, as we made no discovery beyond finding a few surface pieces. Whilst I was thus engaged, Mr. Vanasse and the second steward and second engineer were sent in the direction of Table hill, with the same object in view. During my search for coal this day, I happened upon a nest of six owls, and took one of the young ones to keep on board the ship. The chief officer and Quartermaster Lessard, were sent to Hearne point to leave some records, and during their trip found some coal.



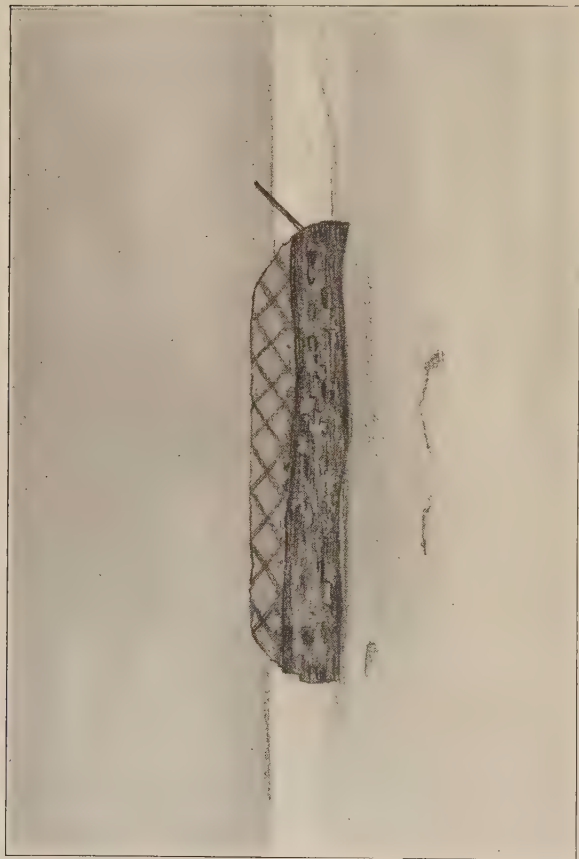
View from Dealy Island, East, towards Point Palmer, Bridport Harbour to the left. One of the finest harbours in the world.



J. O. Morin, Second Officer of "Arctic" and Party, on Dealy Island, Spring of 1909.



Depot built in 1854, by Captain Kellett, on Dealy Island. Re-covered in 1909.



Cache at Dealy Island, after it was covered.

Further Search for Coal.

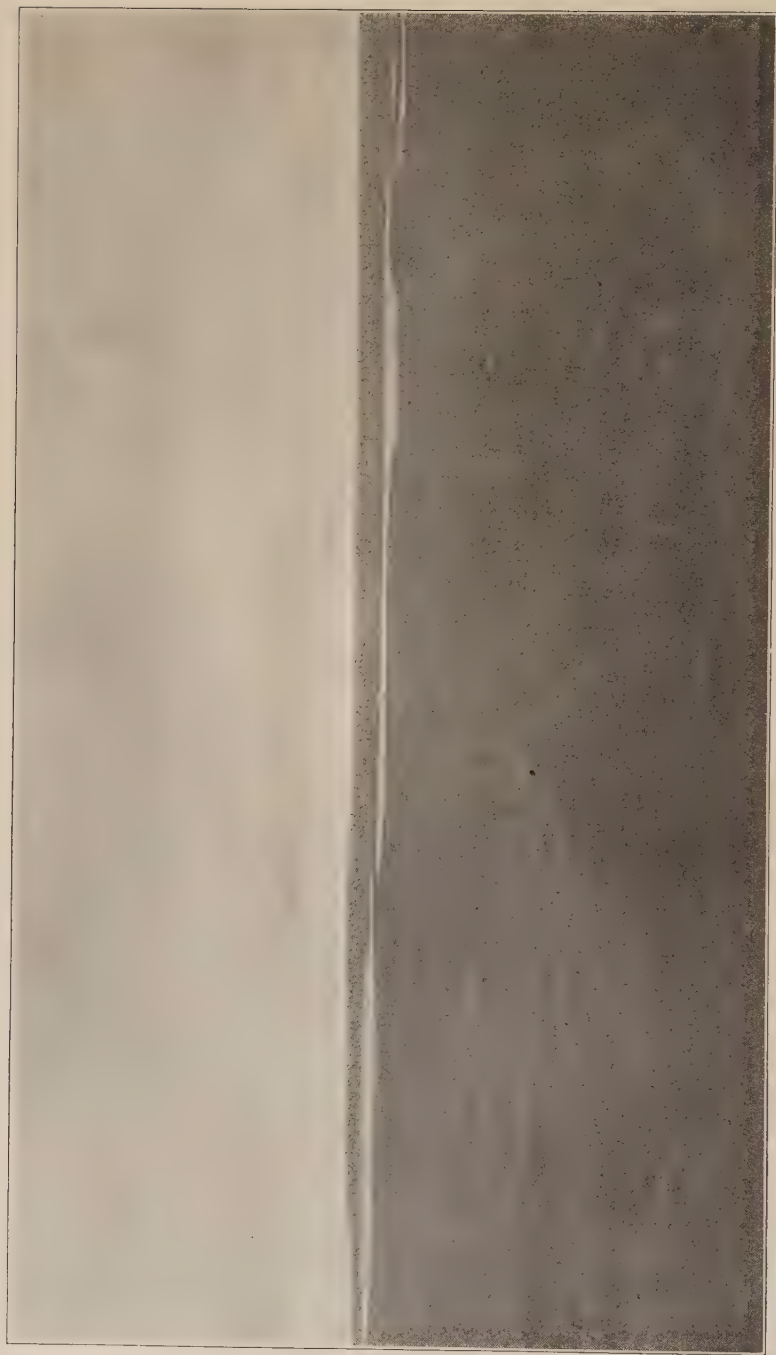
On the 17th of the month, I took with me A. Bouchard to examine the place where the coal had been seen by the mate, but found on my arrival at the spot, that a camping party of the 1852-53 expedition had left moleskin clothes, wood, a copper grummet, broken tins and coal. The materials were taken on board for examination, but the usual disappointment in connection with the discovery of coal, seemed to accompany every attempt to find a seam or deposit. Several pieces of coal were found at Hearne point, along the beach on both sides of the point, carried there apparently by ice. I believe, however, from the evidence which the scattered pieces afford that it is not far from the surface and in a considerable quantity; perhaps under water along the coast near where we had made our searches.

Fine Weather.

We had fine weather for general work and for excursions to a distance, and Mr. McMillan, the geologist, took with him Reuben Pike, an intelligent seaman, on explorations to Liddon gulf. J. Lessard went 6 miles west of the ship to ascertain the state of the ice, and reported it was very white with much water on it. It was now, on July 20, beginning to break up in the harbour. The first thunder of the season was heard on this day, although the wind was from the north. The variation was found to be 94° easterly, accounted for by the electricity in the air. About this time, we found a large lake about 4 miles southwest of the ship, and on our way back to the vessel killed four large deer in excellent condition; we also killed, on the 23rd, a fine musk ox which weighed 350 pounds, dressed. We noticed the ducks were arriving and other wild birds, which usually accompany the short summer season of these northern countries.

Parry's Garden.

We found, at this time, Commander W. E. Parry's garden, but the weather on Melville island is unsuitable for the growth of vegetables, and no success followed gardening in his time, all the seeds sown having been practically thrown away. Flowers



Lake 3 Miles South West of Winter Harbour, Melville Island.

indigenous to the soil and grasses grow luxuriantly; the flowers come to perfection. Some varieties were collected and brought with us.

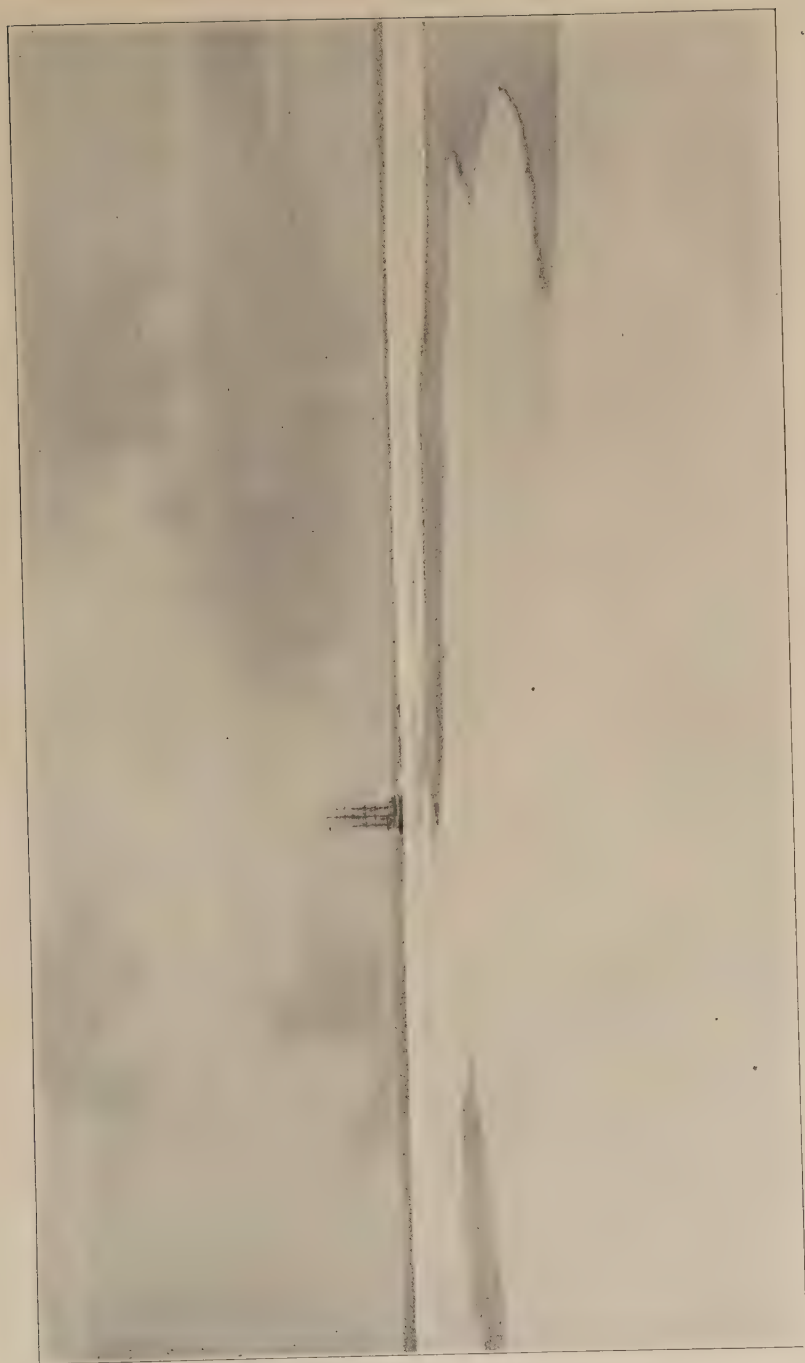
Getting Ready for Sea.

We were anxious to leave Winter harbour to continue the voyage of the *Arctic*; and the vessel was prepared to leave on the first opportunity. Steam was now applied to the machinery to test it; the engine, winch, windlass and electric light apparatus worked satisfactorily. The vessel was drawing 17 feet 10 inches forward and 19 feet 10 inches aft; in good trim for battling with ice. On July 30, the ice moved in the harbour, to the southwest, about 20 feet. We had been employed for some time cutting the channel, to allow our ship to get out of the harbour, and good progress had been made. On the last of the month, the ship was turned around in her winter berth; we found the ice elastic. Before making an attempt to take the vessel out, I went with the chief officer to ascertain the state of the ice outside. I was pleased to see that it was melting and going very quickly. On August 2, we began to break the ice with the ship, and made good way towards the outside of the harbour; the depth of water increasing to ten fathoms. The ice moved off Hearne point in the strait and went eastward.

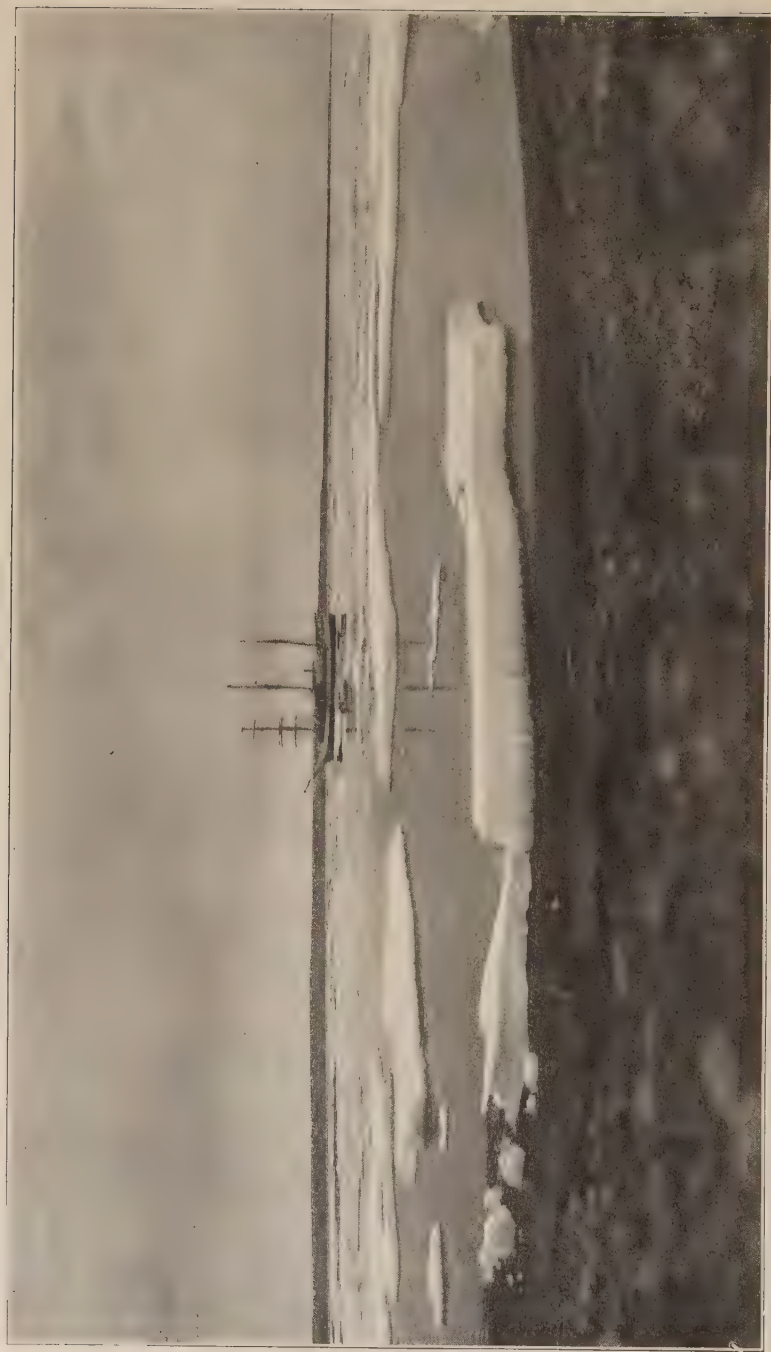
We were now preparing to leave the place in which we had spent many months, with their varied experiences, at times having sunlight, and at one period the monotony of three months of darkness, which made our sojourn one never to be forgotten. The 3rd of August brought strong winds from the northwest, blowing about 40 miles an hour, but having some records to place, I went up on the hills to do this and there obtained a good view of the moving ice in the strait. I saw a large crack; this gave encouragement, and immediately we set about taking on board everything remaining on shore; among them was the tent of Mr. Jackson, the meteorologist. At 2 p.m., of August 3, the ice in the harbour broke and took us with it. The ship drifted near the tail of a bank, where we sounded and found only $3\frac{1}{2}$ fathoms of water. Both anchors were out and the vessel went full steam ahead. We drifted clear of the harbour and anchored near the leading beacon. The ice in



The "Arctic" in Winter Harbour.



"Arctic" in Winter Harbour. Ice breaking, 1909.



"Arctic" in Inner Winter Harbour.

the strait was drifting to the eastward, and at 8 p.m. it closed the harbour again, but we kept up steam, and proceeded to the inner harbour, mooring in $3\frac{3}{4}$ fathoms of water at low tide. On Friday, the 6th, the inner and outer harbours contained a great deal of ice; being unable to proceed to sea, I went on shore to a prominent hill to learn the condition and movements of the ice outside the harbour; it was drifting eastward in the Strait. Such large quantities of ice drifted on the shore of Melville island, that no water could be observed from the crow's nest of the mast. I continued these observations of the ice, and with Mr. Vanasse and N. Chassé went to Fife harbour, to ascertain if water could be seen to the eastward, the direction which we intended to take when we got clear of Winter harbour. It should be recorded here, that on our way to Fife harbour, we found coal all along the beach, but none was seen in place.

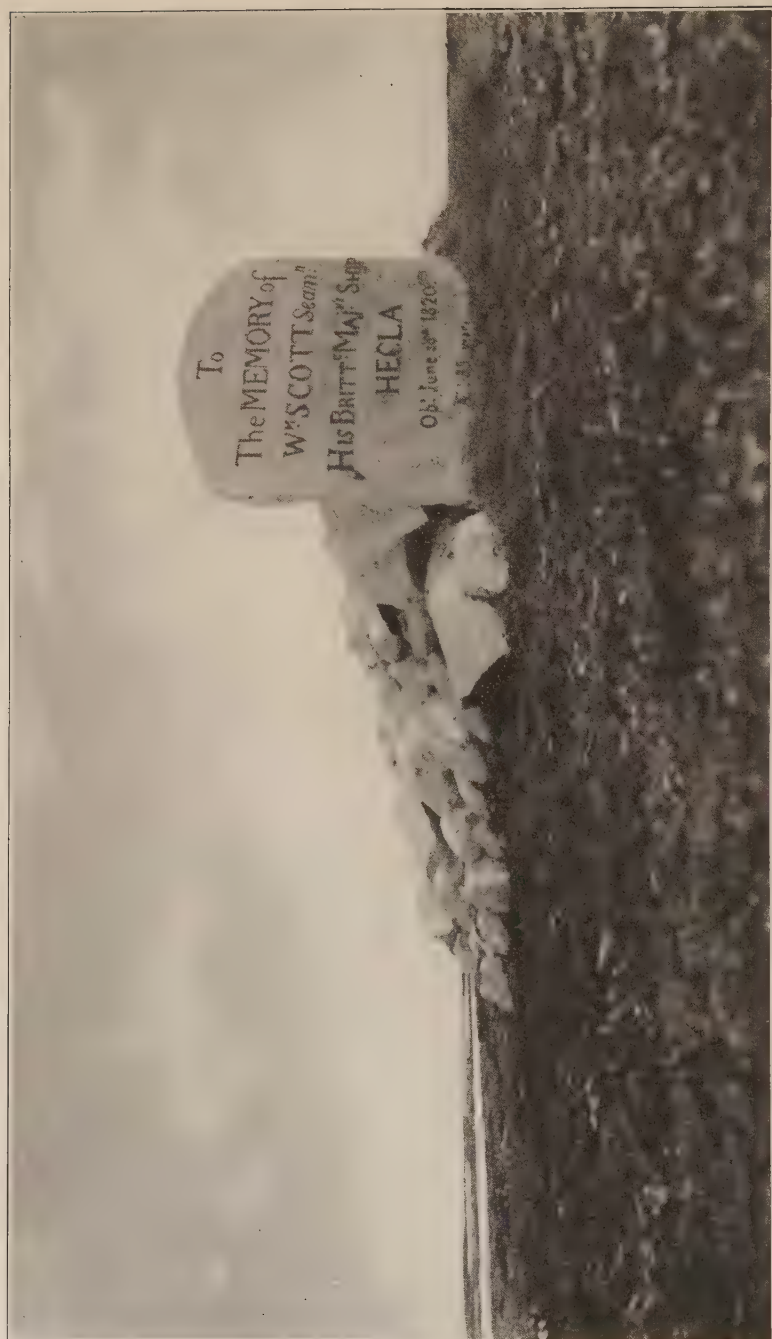
At 6 p.m. of the same day, while the ship was riding at anchor, a large pan of ice came towards the ship, compelling us to pay out chain to keep our position safely. On the 8th, we were menaced by another large piece of ice which drifted into the harbour and dragged our port anchor at low water, causing the afterpart of the ship to touch a mud bank, but we hove our anchors and steamed to the outer harbour and anchored in 10 fathoms of water. On the 9th, the wind came from the south, with cloudy weather; this wind forced the ice upon the coast, but the sea was having its effect upon the large fields and pans of ice and broke them up, relieving us of anxiety, as no further danger was apparent. We went on shore to a hill, for another observation of the ice movements in the Strait. While on shore, we saw a herd of musk oxen, but decided not to kill them then; we afterwards drove them towards the ship; nine were killed, and all day was occupied in dressing them and taking the meat on board. One small one was taken alive and conveyed on board. In connection with the event of killing the animals, I should say they were arranged in a form of defence; the leader, a large bull, rounded up the entire number to make a stand against us, and he alone made a charge as if feinting an attack, but wheeled around and joined the herd.



State of Ice after leaving Winter Harbour, 1909.



"Arctic" beset in ice off Cape Bounty, Melville Island.



Grave Stone of William Scott, carpenter of "Hecla," died in 1820.

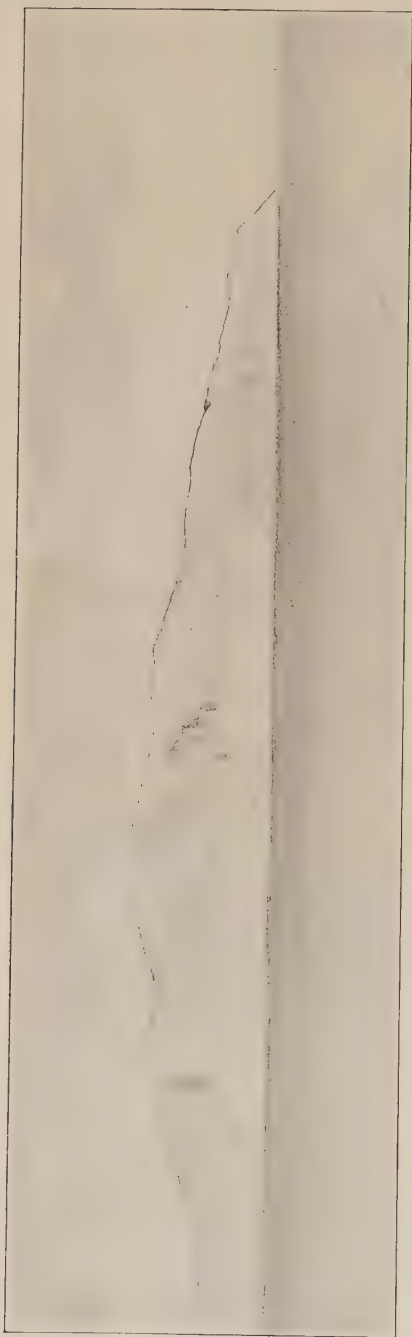
CHAPTER X.

Leaving Winter Harbour.

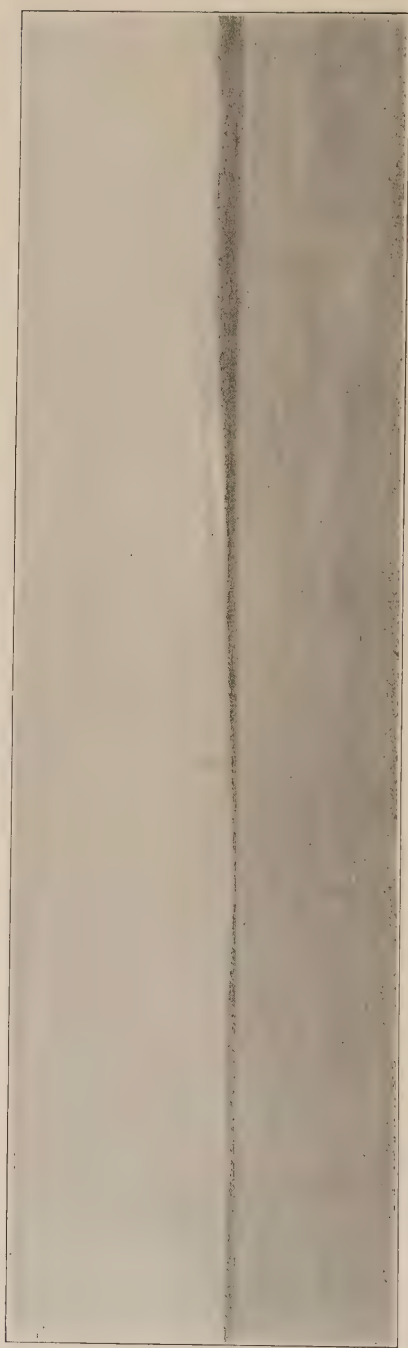
During the night of August 11, we were compelled to keep up steam to clear the pans of ice which were driven towards us by the wind; but the breeze moderated, leaving open leads to follow, and on the 12th at midnight, Winter harbour was left. We steamed along from lead to lead, with the wind from the westward and snow flurries, our vessel working the tides; we arrived off Cape Wakeham, where we stopped for the night, fast in the ice. We saw Halse point, but could not pass it owing to the shallowness of the water around the point. I discovered that the point extended out into the bay, farther than it is indicated on the chart. Halse point can be easily recognized by the immense amount of ice which grounds on it, giving it the appearance of a long row of small icebergs. The vessel was made fast, in the ice, off Cape Wakeham, and our fresh water tank was filled. The day was calm and foggy, but a change of wind from the westward cleared the air, and we proceeded slowly between pans of ice until compelled to moor at a point 5 miles off Dealy island. On Saturday, August 14, we passed Dealy island and sailed along the coast of Melville island, eastward. The wind was changeable from west to north, all the time increasing the different leads. We took soundings, and found the depth increasing from 15 fathoms until we had 40 fathoms under us. The wind was now blowing strong, and we took off sails and ran to windward of Byam Martin channel, where we found the ice much broken but in large quantities.

Byam Martin Channel and Griffith Island.

I purposed going north through Byam Martin channel, and steamed north a distance of 27 miles, but finding the passage beyond that point entirely blocked with ice, the vessel was made fast to the ice for a time to ascertain if there was any likelihood of openings. Finding no opportunity to go farther, we



Cheyne Point, Griffiths' Island.



Sunset in Skene Bay.

drifted south, and came to anchor under Griffith point, in 15 fathoms of water. Next morning, Mr. Jackson and Mr. McMillan went on shore for observation and exploring purposes.

Griffith Point, Melville Island.

As already stated, this is a fine island. We had more evidences of it by walking on shore over some parts of it near Griffith point, where eight musk oxen were seen together, and on the following day, the 16th, we saw six more of them. They were not disturbed, as our purpose on shore was to secure objects and specimens of any kind that would be interesting or valuable to add to our collection of relics and natural history specimens. We picked up some pieces of coal of sufficient size to take with us for analysis on our arrival back, or to place in the Geological Museum at Ottawa. We also built a small cairn, 5 feet high, on a rock 80 feet above sea level, $2\frac{1}{2}$ miles west of Griffith point and 1 mile inland.

From the hills, we saw that the ice was clearing, and we left for Byam Martin island. At midnight, we were 25 miles north-northeast of Griffith point, and encountering immense floes of this year's ice. The leads were followed in a north-northeast direction, towards the north end of Byam Martin island. We now took several soundings, and found the depth from 56 to 60 fathoms. Our progress was very slow; in fact we were hardly moving forwards, and at midnight could not get any farther on our course. We began to drift back to the southward with the ice, in 108 fathoms of water. On the morning of the 18th, the wind changed to the northwest and blew very strong, pressing the ice on the land. Whilst drifting to the south-southwest with the ice, we took soundings at 65 fathoms; only a narrow lead was open to us along the land, but it was unsafe for us to proceed so close to shore. The ice with which we were at this time battling, was old polar ice which came from the polar basin down between Byam Martin island and Griffith point.

Landing on Byam Martin Island.

On August 19, we began to work between the ice and Byam Martin island, and by dint of careful and constant effort, we



Raising Flag Second Time, on Byam Martin Island, 1909.

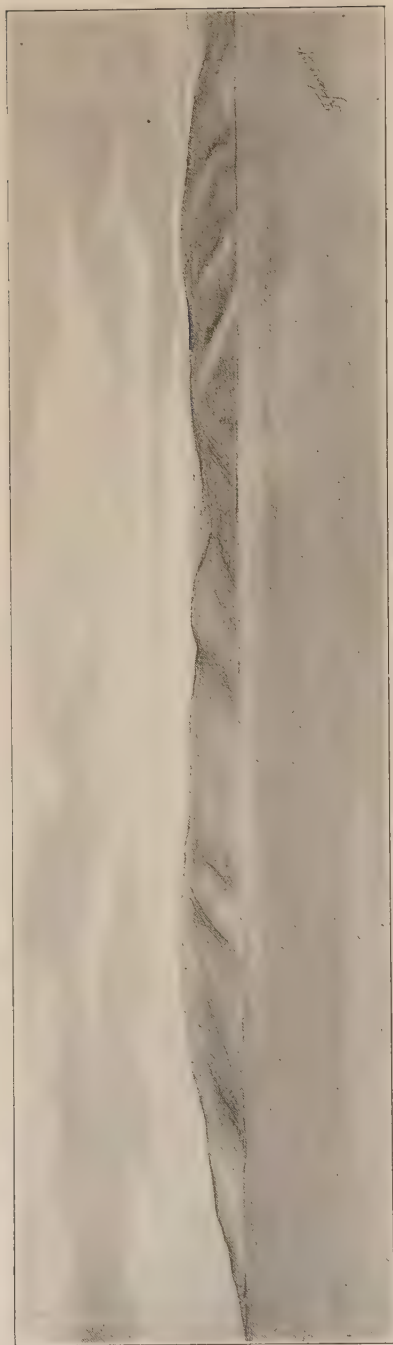
got clear, and shaped our course towards Point Gilman, on Byam Martin island, where we anchored 2 miles west of the point, in 15 fathoms of water. I landed at Gilman point, and found the record of our voyage of 1906, to which I added a record containing information respecting our wintering at Winter harbour, date of leaving and our progress up Byam Martin channel a distance of 60 miles and sailing around Byam Martin island. Whilst engaged in depositing the records, we saw the ice moving in the offing, and returned to the vessel as quickly as possible. There had been sufficient time after landing to observe objects and traces of musk oxen and deer, and to pick up coal.

In order to get our ship out of danger we got underway, and moved more to the westward and anchored again. I observed, on Friday, the 20th, that the ice was drifting from the east to the west from no apparent cause, moving at the rate of about half a mile an hour with the wind from the north-northeast, our latitude at the time being $75^{\circ} 6'$ north, and longitude 104° west. I was very desirous of getting north in Byam Martin and Austin channel, to make soundings, with the object of learning whether the bottom towards the northwest was shelving or deep, and thus be able to form an opinion in regard to land to the northwest of Melville and Bathurst islands. Although we had made two unsuccessful attempts, I was determined to get as far up the channels as the ice would permit.

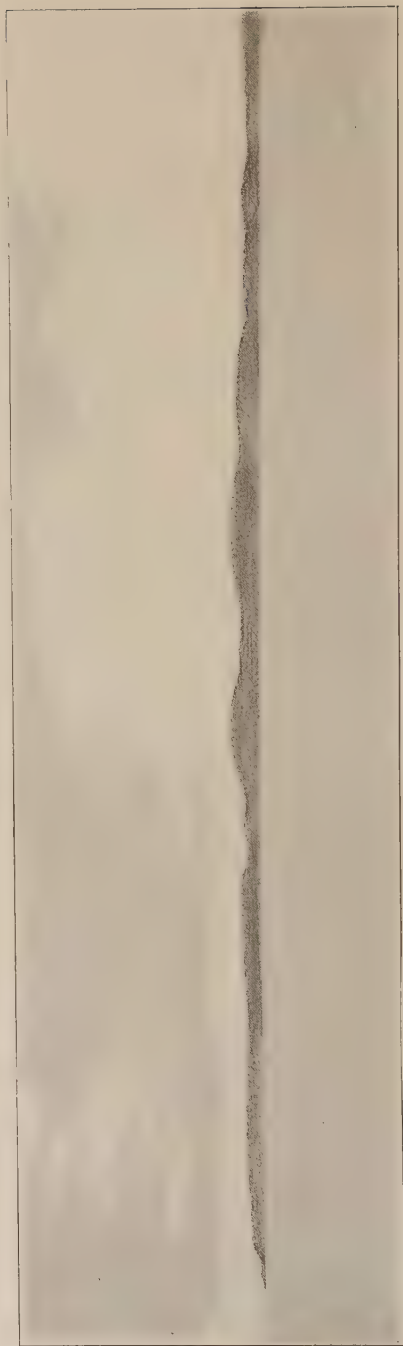
Landing at Hotspur Point.

On Saturday, August 21, we came to off Cape Hotspur, and moored to the older ice. Success point was in sight to the northward, and at 8 a.m. I took some men with me, built a cairn about a quarter of a mile north of Hotspur point and left a record. So far as I am aware no vessel has been navigated so far north in this channel; sledge parties have traced the coast line on foot and named the headlands and bays.

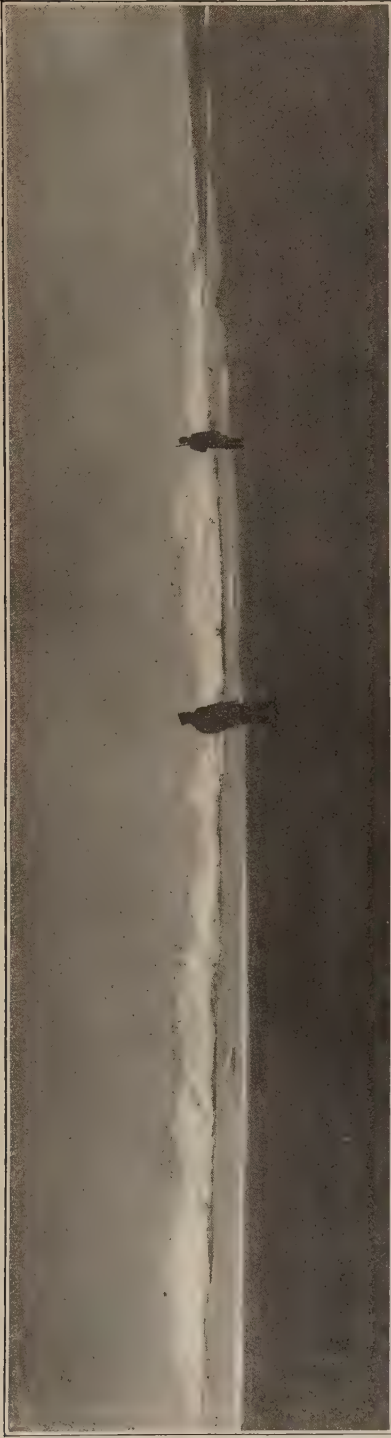
Mr. Jackson landed with another boat for magnetic observations, and Mr. McMillan took two men to search for minerals.



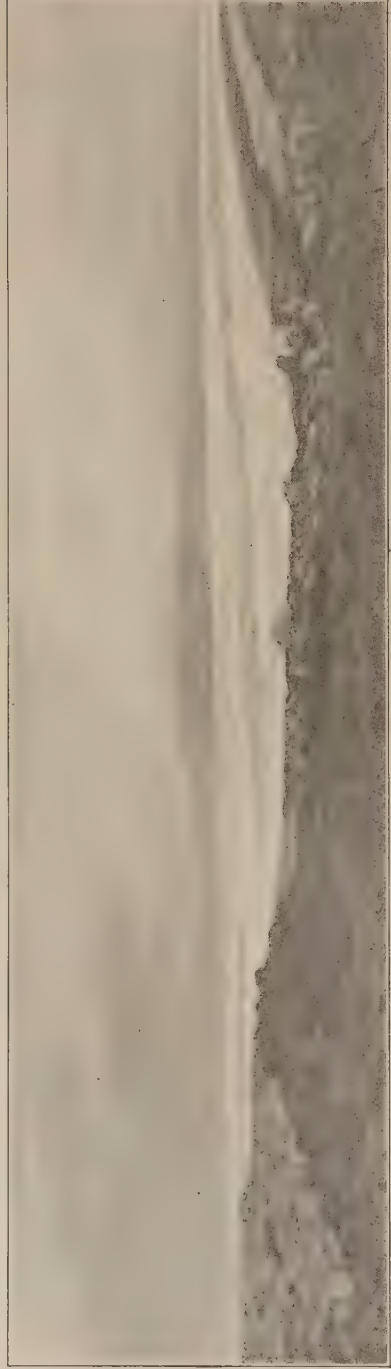
Hotspur Point, Bathurst Island.



Northern part of Byam Martin Island, 1909.



Ice pressure at Hotspur Point, Bathurst Island.



View from top of Mountain Hotspur Point, looking towards Polar ice.

Navigation of Northern Waters by the First Explorers, shown by
Documents found at Winter Harbour and Dealy Island.

The opportunity for resuming patrol work had now arrived, and the *Arctic* was all ready to begin the difficult work of navigating channels and straits made intricate by heavy moving ice. Accounts of the perils met by early navigators whose object was the discovery of the northwest and northeast passage, prepared me to look for bodies of ice, moving with the tides and winds, likely to obstruct our way. I had already made a voyage to these waters, and had become familiar with the coast line. The surveys of the pioneers Parry and Liddon, in these waters in 1819-20, of the coast of Melville island and both sides of Lancaster sound were familiar, as well as the surveys of the heroic and intrepid mariners, from 1850 and 1854, who strove to bring back tidings of the expedition of Sir John Franklin and Captain Crozier.

The work of Kellet, McClure, McClintock and Collinson, performed under great hardship and uncertainty, presented to me at the time a field for close study and admiration. It was not only a matter of curiosity, but of great pride, to be able to verify the published statements of Parry concerning his famous voyage, and also of Commanders Kellet and McClintock, to whom were entrusted by Commander Belcher, the western explorations to Melville island, Prince Patrick island, Bathurst island, Cornwallis island, Banks island, Victoria island and the smaller islands of the Archipelago. The *Resolute* and *Intrepid* were the vessels commanded by these energetic officers.

The more northern explorations were made by Osborne, Hamilton and Richards, officers under Belcher, while his own vessel the *Assistance* wintered in Northumberland strait on the northwest of Grinnell land. A rendezvous was established at Success point on the northwest of Bathurst island, and one at Beechey island in Barrow strait, as meeting points for orders from Commander Belcher, who communicated by sledge parties from his vessel in Northumberland strait. The *North Star*, commanded by Captain Pullen, was stationed at the rendezvous at Beechey island containing stores, and a house was also built for the same purpose.



H.M.S. "Hecla" passing an Iceberg July, 1819. Parry Expedition in search of the Northwest Passage.



Situation of H.M.S. "Hecla" and "Griper" 4th July, 1819, under command of W. E. Parry, navigating the Northwest Passage.

McClure and the Fate of the 'Investigator.'

McClure had begun his search for Franklin in company with Commander Collinson who was his superior officer, from London in 1850, and passed through Magellan strait, afterwards calling at Honolulu where he and Collinson procured stores. The two vessels became separated, the *Investigator* out-sailing the *Enterprise*, or rather sailing a different course. McClure made Behring strait first, and continued his voyage without waiting for Collinson, although he had been advised by Captain Kellett who was then in the same waters to wait. The *Investigator* was several days in advance of the *Enterprise*, and her course northeastward was continued until Banks island was sighted and the coast followed in search of Franklin around the northeastern end, and partly down Prince of Wales strait between Banks island and Victoria island. The *Investigator* wintered in the strait off Princess Royal islands, in latitude $72^{\circ} 50'$ north, longitude $117^{\circ} 35'$, during the winter of 1850-51. After the liberation of the ship the southern end of Banks island was rounded, and the *Investigator* passed north again until Bay of Mercy was reached, from which harbour the vessel never emerged unless she has drifted out since her abandonment in 1853.

McClure with sledge parties crossed the strait named after him to Winter harbour, and there left records on Parry's rock with the hope that Sir John Franklin might become acquainted with the fact that the *Investigator* was fast in Bay of Mercy. These records were found by Captain Kellett after McClure had returned to his vessel, and Lieutenant Pim and Dr. Domville, of the *Resolute*, were sent by Kellett to communicate with McClure and apprise him of the fact that the *Resolute* was at Dealy island, a short distance from Winter harbour.

The papers found by me in Kellett's depot at Dealy island, contain a rather pathetic story of the weakened and debilitated state of McClure's crew, immediately previous to the abandonment of the *Investigator*. Commander Kellett, who was at the time the superior in rank to McClure, directed him to have an examination of the men made, and to call for volunteers who might be willing to remain another season on board the *Investigator*.

The medical officers reported that the men of the crew were in no condition to pass another rigorous season on board ship, and any attempt to do so would be sure to meet with fatal results. The officers, the carpenter and four seamen, with great pluck volunteered to stand by the ship, but the number was not sufficient to man the vessel, therefore there was no other course for McClure than to abandon the *Investigator*; this he did with regret and left her to the charge of the ice and winds. Before doing so, he caused to be cached enough provisions for 66 men for four months, and anchored his vessel in a position that he supposed would allow her to be cast upon a shoal, where, he said, she would last for ages. He was mistaken, however, as no sign was visible of either the cache or vessel when the officer and men of the *Arctic* visited Bay of Mercy in the spring of 1909.

Commander Collinson and his Voyage in Search of Franklin.

Collinson, who had been given the chief command of the two vessels *Enterprise* and *Investigator*, made his voyage through Behring sea and proceeded north to a higher latitude than any navigator in the western part of the Arctic ocean, reaching above 73° north. He made a circuitous course in search of Franklin, and also at the same time giving his attention to a search for McClure. Signs of the landing of the latter were observed upon the coast, but when these ceased he shaped his course in a southeasterly direction along the coast and passed through Union and Dolphin strait, Coronation gulf and Dease strait, to a point in Victoria strait, within sight of the place where Sir John Franklin died, but did not know it. The exact spot where the lamented Franklin ended his expedition was afterwards discovered by McClintock, and it was then made known, that Collinson was near the object of his search. Collinson wintered in Cambridge bay, and returned westward to Behring strait and sailed for Hong Kong, where he despatched copies of his documents to the Admiralty.

Commander Kellett, 1849-50.

Captain Henry Kellett had made a voyage to Behring strait previous to his joining the expedition of Commander Belcher, and had met McClure in the Arctic ocean on his way sailing

northeast. Kellett reached Herald island in Behring strait, and returned with his ship to the Pacific ocean and around Cape Horn, successfully reaching England.

Commander Kellett's Voyage in 1852-54.

His voyage with Commander Belcher to Lancaster sound, in the *Resolute*, was the beginning of the eventful period between 1852-54, in which Kellett was in charge of the western expedition already mentioned, in search of Franklin, comprising the waters in Barrow strait and of the southwestern part of the Arctic archipelago, including Banks island and Victoria island south of McClure strait.

This fine officer was well worthy of the confidence of the Admiralty, who placed him second in command to Belcher; he eclipsed his superior officer in his discoveries and executive ability, most ably aided by the activity of McClintock. The hardships, adventures and experiences of Kellett, as well as the ships under him, are but a memory of the past, but his depots and cairns for assistance and guidance of ships, are monuments of his forethought. His bravery was undoubted, and his refusal to abandon his ship unless a peremptory order was given by Commander Belcher, furnishes proof of his decisive character as a sailor and dogged purpose to do his utmost, in the search for Franklin.

The records which he had gathered from others, as well as copies of his own orders, were carefully deposited in safe places for the assistance of other navigators, entertaining always the forlorn hope, that Franklin might find his way to Dealy island. The large depot on the island was well arranged and the plans of stores prepared with infinite detail, show his thoroughness. He carefully noted the safest routes to the rendezvous, the number of hours which his men should travel and rest and the food they should be supplied with: during his final days of command in the western division of the expedition he travelled six hundred miles on foot to the *North Star*, which conveyed him back to England in company with the crews of the five vessels abandoned by the order of Commander Belcher.

Lieutenant McClintock.

Lieutenant McClintock of the *Intrepid*, and second in command to Captain Kellett, early showed his great activity by making sledge journeys of a hazardous nature across Melville island, from the locality in which the *Resolute* and *Intrepid* were frozen in near Dealy island. The tracings made by McClintock around the shores of Melville island and Prince Patrick island, on foot, added many hundreds of miles to the coast line of the territory surveyed under Belcher and Kellett. The cairns established by him, between 1852 and 1854, are mentioned in his reports to Captain Kellett, and I have included facsimilies of these reports with the papers found at Dealy island.

His subsequent career in navigating the waters, in Lady Franklin's yacht *Fox*, of Peel sound, Regent inlet, Bellot strait, King William island and around Montreal island and Boothia peninsula, in 1857-59, are well known. His brilliant achievements and discovery of definite information, regarding the fate of Franklin, points to him as the most fortunate of all the voyagers who pursued the most remarkable search known in the history of navigation.

Other Officers of the Belcher Expedition.

Whilst the summary is given of the achievements of the leading officers who made the Arctic Archipelago the field of their search and explorations, mention should be made of the subordinate officers under Belcher and Kellett, some of whom journeyed on foot with sledge parties around the northern shores of the islands, and others across McClure strait, down Prince of Wales strait. Osborn, Austin, Richards and Hamilton, from Belcher's ship *Assistance*, traced the coast of the northern ends of the islands, and Krabbie and Meham, in the southern part, crossed McClure strait and part of Melville sound and found evidences of the landing of Collinson in April, 1851, on the north end of Victoria island.

**Facsimilies of Documents left at Winter Harbour by Parry in 1820,
and Documents left by Kellett in 1853-54.**

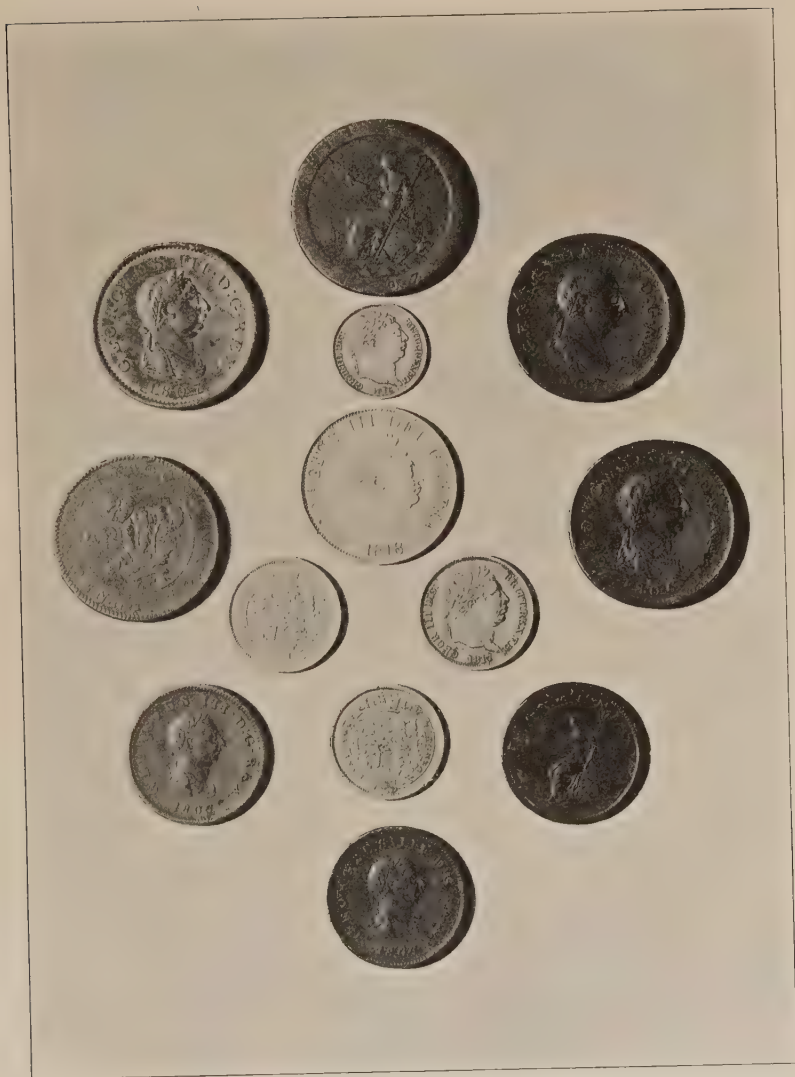
It is deemed of sufficient interest to readers of this report, to here insert, facsimilies of several documents found while at Winter harbour and Dealy island. The paper records were a mass of pulp, and much time was necessary to dry and separate them. They were more than curious documents to me, as I found much information on reading them, of a useful nature, relating to the localities which I intended to visit if possible. One of the documents was encased in a copper tube, which I detached from a pole surrounded by loose rocks and placed there by McClintock. Another was found outside Kellett's depot, probably disturbed from its resting place by a bear as it bore marks of the paw of some animal of size. The most of the documents were found in a box where they had been placed by Kellett, who with his usual minute directions given in his reports, indicated where he had placed the box in the large cairn.

All of the papers have not been lithographed, but copies have been made of the balance, and they have been printed as an appendix to this report. A valuable meteorological table made by McClure when he wintered in Prince of Wales strait in 1850-51, is printed for comparison with the tables of Mr. Jackson, the meteorological officer on board the *Arctic*.

Attention is drawn also to the document which was found on Cone island, Jones sound, on our voyage of 1906-7, left by Commander Otto Sverdrup, whose exploration voyage has been briefly described in the summary of voyages to Smith sound.

His Britannic Majesty's ships *Hecla*, Lieut. William Edward Parry, Commander, and *Griper*, Lieut. Matthew Liddon Commander, being an Expedition for the discovery of a North-West Passage, wintered in the Harbour near this place, A.D. 1819-20. The Latitude of the Anchorage was found to be $74^{\circ} 47' 10''$. The Longitude $110^{\circ} 47'$ West of Greenwich. The Dip of the Magnetic Needle $80^{\circ} 37'$; and its Variation $127\frac{1}{2}$ Easterly. This Expedition advanced, during the Summer of 1819, as far as the Meridian of 113° , having discovered an outlet from Baffin's Bay into the Polar Sea, through Sir James Lancaster's Sound. The Strait through which their passage was effected, (being a prolongation of Lancaster's Sound), was named Barrow's Strait. About the Longitude of $89\frac{1}{2}$, they discovered and sailed into an Inlet, (named Prince Regent's Inlet) as far South as Latitude $71^{\circ} 54'$. In Longitude $92\frac{1}{2}$, the North Shore of Barrow's Strait ceased to be continuous, and between $93^{\circ} 40'$ and 114° , in Latitude 74° to $75^{\circ} 15'$, Nine Islands were discovered, and named the Islands of St. Peter & St. George, in honour of His Majesty King George the Third. The Expedition sailed from hence in the Summer of 1820, in prosecution of their Enterprise, being in good condition, and having 16 months Provisions & fuel on board.

Matthew Liddon } Commander of }
the *Griper* }
William Edward Parry } Commander of }
the *Hecla* }



Representations of Coin found by Captain Bernier. Left by Commander Parry, 1819-20, at Winter Harbour. Reduced in size.

Deposited by a Party under the command
 of Proceeding in search of
 the Franklin Expedition from Resolute,
 Assistants, Steamers, and Intrepid,
 left at Winter Quarters between Griffith and
 Cornwallis Islands; at the latter,
 Expeditions under Sir John Ross, and
 Captain Penny.- Proviants and Boat
 of Lee, Ross, and
 Cape Spence.

May, 1851.

Copy
 Henry Kildall's report

(No. 1)

By Henry Kildall Surgeon CB
 Captain of Her Majesty's Ship
 Resolute and Surgeon of the
 i. Barrow Strait.

Whereas from the debilitated state in which that part of the crew of Her Majesty's Ship Investigator which arrived on board the Resolute on the 22nd Inst. I consider it necessary that a Survey should be held on the Resolute.

You are hereby required and are directed to proceed on board Her Majesty's Ship Investigator, and there hold a strict and careful Survey on all the Officers, Seamen and Marines on board accordingly.

The report of your proceedings herein to be made in duplicate, and contain information under the following heads: Name, Rating, Age, State of health, Whether fit to undergo the rigors of another winter in this climate, and whether volunteers or not.

Before deciding on their going or otherwise to remain another winter in this ice, the medical Officer will duly consider the advantages to be derived from placing the crew on a full scale of provisions (of which for these last eighteen months, they have had but two thirds allowance

or less) together with the addition of
any game that may be procured,
not forgetting also that they have
already been three winters in this
climate

and you will perform this
service with such care and accuracy,
that you may be ready, if required
to make solemn declarations to
the impartiality and correctness
of your proceedings

Given under my hand on board
the U. S. Ship Resolute, Winter Quarters
Sealy Island this 5 day of May 1853.

(Signed) H. Kellett

Captain

Copy

H. M. S. Reliance. Captain

A. 13

H. M. S. Ship Investigator
Barrow, Islands 24 May 1853

Sir,

I have the honor to enclose the report of Survey upon the Officers and crew under my Command, and also to request you that the different heads to which you have directed the particular attention of the surveying Officers have been carefully attended to, also that the letter addressed to me accompanying the order for Survey dated 5 May 1853, has been read and explained to the crew in a manner I believe on a hope in strict conformity with your benevolent intentions, the result of the whole, as I am sorry to add has led to the abandonment of the Ship for the day only for further service appearing amongst the entire crew - The Officers with the solitary exception of Mr Ford the Carpenter, I have the greatest satisfaction in stating, come forward in the most noble and spirited manner to tender their further service but even this would not raise the amount to the number which I think adequate to work the vessel. Consequently I have no alternative but to carry into effect, reluctantly indeed the painful duty above.

Captain

H. Kellie C.B.

H. M. S. Reliance

mentioned

In the subject as embraced in its
 dimensions, the business appears here to
 enclosed and upon which it is not now
 necessary to offer any observations.

I have also to acquaint you that at
 present, we are here engaged to land a
 House and Provisions which I intend
 shall form a depot for four months for
 66 Men, as soon as this duty has been
 accomplished, and the house occupies
 so that should the ice drift out the
 day, it will throw her upon a shoal, which
 is within two hundred yards of
 position, here she will remain for
 ages a comfortable asylum for any
 parties that may ever require succour
 upon this side of the strait, and make
 in combination with the large Depot and
 house which you have at Deal, Island
 the perfect arrangement for the safety
 of our expeditions requiring succour on either
 side of these waters; for with the
 remainder of the crew to join you
 at Deal, Island.

I have the honor to be
 Sir

Yours most obedient
 humble servant

(Signed) Rob. McClure
 Commander.

From the Hotel, Cape...

*H. M. Ship Surveyor of the
Bay of Wharfe, 23rd May, 1853*

In obedience to your order conveyed to us through Commander McClure directing a survey to be held on the officers and men remaining on board this ship, with a view of ascertaining their general state of health, and efficiency for further service in the Polar Sea.

We have the honor to inform you that we have this day held a most complete survey according to the results thereof, that the general state of health is such, as renders them utterly unfit to undergo the rigors of another winter in this climate without substantial reinforcements, and some apprehension for the consequences.

There exists in all of them at present, with one or two exceptions, not marked evidence of scurvy and debility in various stages of development with great loss of flesh and strength as may be seen from the remarks appended to the name of each in the accompanying list: which calls for their departure from these regions as early as possible, a matter of urgent necessity, and the adoption of prompt means to ensure the same, that they may be placed under the salutary influence of such anti-scorbutic and other agents, as are

Edmund

essential for their recovery and ultimate safety.

We are also of opinion that the reduced allowance of provisions on which we have been sustained for a period of nearly twenty months, is one, which we consider, and the past experience of others has likewise proved, to be quite inadequate for maintaining the health of men, exposed to the rigorous influence of this climate.

That it has rendered them less able to generate an amount of animal heat sufficient to resist the intensity of the cold, while it has established a pre-disposition to the attacks of that disease (Fever) the germ of which now so universally prevails amongst them, in the its usual distressing influences on the system, likewise condensing them highly susceptible of other diseases, and unable to withstand the privations to which they have been exposed and which are inseparable from Arctic Service, is sufficiently obvious as their present condition, but too fully, proves.

It is likewise our opinion that from their present state, and conditions, the remedial resources of the Ship would be insufficient to establish such a state of health and efficiency as to afford any guarantee against the recurrence of diseases which could not fail to result from the circumstances of remaining in the Ship and exposed to the intense severity of another (the fourth) Arctic winter after the effects of a sojourn so long as that which

which has fallen to their lot to have
experienced

Be have the honor to be

Sir

Your most obedient servants

(Signed) Alex Armstrong
Surgeon H.M.S. Investigator

(Signed) H. J. Downville M.D.
Surgeon H.M.S. Resolute

To
Captain Henry Kellett
C.B.
H.M.S. Resolute

This is a House that-Sack built. which I have named
The Sailors Home. under the especial patronage of my
 Lords Commissioners of the Admiralty -

His Royal. Sailors and Marines are fed, clothed and
 receive double pay for inhabiting it. The first stone was laid
 just June 1853. The Building completed and ready for occupation
 on the Twenty third of July '53, under the able direction of
 Mr. Dean Carpenter of HMS Resolute. Dimensions 40 x 46 feet.

The walls are four feet thick. the Eastern wall 8 feet high the
 Western of it has taken about 100 tons of stone to build it. The roof
 is supported by Pillars in the Centre is covered with new
 Canvas Canvas then a covering of Lead Boils. and lastly with
 new Canvas painted white. - The accompanying plan shows
 how the Provisions are stored, and within the doors are dry.

The Provisions left here are sufficient to sustain a party of
 Sixty Six Men on full allowance for two hundred and ten
 days with three Ammunicions men for 2 -

Should any party of Men reach this before the 1st of June
 they should push on for Beechey Island once. After the
 close of the navigable season (End of September). Wellington
 channels run in. before of a late day. would be too late
 and short for Beechey Island on the first of April. Leaving
 at this time they would have thirty days Provisions (3600 lbs)
 to carry them to the depot at Beechey Island. Where there is
 a good house 40 by 25 feet. A Sledge with 10 Men. and
 two Officers under the command of Mr. Roche (mate), left the ship
 on the 7th May and reached Beechey Island on the 22nd days. He
 left Beechey Island again on the 5th June with one man and
 five dogs and arrived here on the 10th (16 days). - Therefore
 I value Cooper's two stages to the Harbour of Mercy is about
 ten from 12 to 14 days. - Consider the best decision
 of the time for travelling is. to travel 6 hours camp for rest.
 14 hours, then travel 3 hours and rest 11 - travelling by night to
 avoid the heat of day -

In the Autumn of 1852 (when) Cooper discovered by a travelling
 party from the Mth Ship Investigator. was found at winter harbour
 (on the sandstone) describing her position. She was found in the
 River of water that in 50-51. and reached the Harbour of Mercy
 in September 1857 passing to the westward of Beechey Island.

On the 10th March '53. Parties (two) Men and Dogs landed at
 Point and Doctor Donnell left Resolute for the Harbour of Mercy.

reaches it in 27 days. Farther than the Investigator, not having
broken out in ice. Her Officers were Cross & have been searched
the ship for a passage to England, abandoning the vessel for a
season. These are the latest journey documents. Investigator 1st
in the Harbour of Mercy is quite sound and tight. Her anchors so
planned that if the ice breaks up the ship would go on to a shore-
ward. These anchors have been landed from her.
She has made but three deaths during her voyage. Her crew
are now as healthy as those of this ship.

No information or notice has been found in records of the
Whitby expedition, and no reliable as to the journey
ship enterprise. Captain Collinson, by way of my travelling parties
if by those of an expedition. With them we have commenced
recoiled. The result of this search to the north and west is
not known here.

The accompanying list will show the most likely to be
been discovered in the Discoveries that have been made. The
revelation of the different expeditions, and the positions
known of the various ships.

There is a most abundant bear (black also at Port J. (Lynn))
about the shore of the straits. These are not with other
kind.

Small birds, and all the water are easily shot and generally
found on the dry ground in the hollows, valleys from the coast line
to form on the water surface.

Reindeer. The deer seen in the beginning of April. The black
tall. One easily shot. The deer, one killed after dropping from injury
in snow. They are found also. One on the dry barren ground
in the hollow valleys.

Stomach contents in great numbers. Little birds in many.
A pair will generally be found on the sunny side of every
large house near the coast.

Quail (Gull) Green (Bent) seen. The first west on snow and
are abundant until the middle of July when the heavy snow takes
on the severity.

Hares are not numerous here. They dwell to the left along
the coast and cliffs. To the westward of the coast line
they are very numerous and are the Harbour of Mercy.

No 10 78

List of Medicines, Instruments and Surgical
 Appliances placed in the Depot House - Dead Island -
 Box - No. 1 - Containing, Tow, Cotton, Lint, Old Linen
 Flannel and Linen Bandages - Biled Silk, Pins,
 adhesive Plaster, Tourniquet, Elastic Catheters, 2 -
 Silver Catheters, 1 - and Pocket case of Instruments
 consisting of - Scissors, Bistouries 2 - Knife 1. Seton
 Needle - Fenaculum - Alpaire's Forceps - Forceps -
 Ligature Thread - Needles - Lancets 2 - Scalpels 2 -
 Box No. 2 - Contains. Purgative, Sedative & Lough Pills
 Laudanum, Purgative and Aromatic Powders, Opium
 Wine - Collodion - Glycerine - Spermaceti Ointment,
 Balsamic Ointment - Calomel - Tartar Emetic -
 Long Splints - 2. Nitrate of Silver - 1/2 oz. and
 Directions for their uses, and mode of Application
 are enclosed in Box No. 1 -
 Brandy 1. Bottle in Box 2

William D. Donoville
 Surgeon of H.M.S. Resolute

Copy
 Hon. Mr. Little Captain

By the Commissioners for executing the
 Office of Lord High Admiral of
 the united Kingdom of Great
 Britain and Ireland.

I have to inform you that we have
 dispatched the Majesty's Steam Vessel *Thetis*, under
 the Command of Commander Inglefield,
 with the *Breadalough* Transport to Recherche Island
 for the purpose of replenishing the Ships under
 your Command with Stores and Provisions
 in case your supplies may have been so
 far reduced by the defect of ice at Pointe
 Barlow, and the various accidents on the
 Coast, as to prevent you from continuing
 further search for Sir John Franklin, during
 this season and the winter of 1853-54.
 If the information you may have gained
 determine you to continue such further
 search

2. In communicating with you on the
 subject of your former orders, and the service in
 which you are employed. We are aware
 how impossible it is for us to send out any
 definite instructions with reference to your
 future proceedings, when we are ignorant of
 the position in which you may now be placed
 or whether any traces of Sir John Franklin's expedition
 may have been found during last Autumn
 or the Spring of this year, and what steps
 you may have considered it most
 expedient to adopt. But if no traces of
 the missing Ships have been found beyond

Wellington Channel, and if it should appear that by the extended search you have been enabled to make in that quarter, that the missing ships did not proceed in that direction, and if Captain Kellett should have reached Melville Island, as directed by his instructions, and his last expedition should also have been guided in finding any such trace it does not appear to us that there is any other direction in which a prospect of their discovery can be expected. Every accessible part of the shore of the Polar Sea, West of Lancaster Sound will have been visited without finding any trace of the missing ships, except their position at Beechey Island in 1845-46. In such a contingency, as this, as it is, should likewise be your opinion, after mature consideration with the senior officers under your command there appears no other course left but to abandon all further search.

3 But in case you should have found any trace of the expedition, it will be your duty to follow up that trace. In doing this you must exercise extreme caution so as not to lose your means of communication with Beechey Island; nor are you to incur any hopeless risk by proceeding beyond unreasonable limits, for the safety of your own crews must be your first care. We place every confidence in your zeal and intelligence, and feel assured that you will act with sound judgment.

W

in whatever situation you may be placed; We therefore leave it to you either to abandon the expedition altogether if you are of opinion that no further steps can be practically taken, or to send such dispatches to England as you may not require transmitting by them to our country, not only a full account of all your proceedings, but also of all your discoveries, and keeping us informed of your views and intentions, ^{as they fall} should be necessary, and may be given you in the summer of 1854.

Before your final departure from the Polar Sea, should you think it prudent to adopt that course, there appears one very important subject which will come under serious consideration, and that is the present position of the ships under the command of Captain Collinson and Commander McClure, who entered the ice to the N.E. of Point Barrow before the latter in August 1850 and the former in July 1851. These officers with their respective crews, may have been compelled by circumstances to abandon their ships. If such should be the case they may probably attempt to reach Baffin's Island, and thence by land to the coast when you left England. We directed in your instructions, that a depot of provisions and other stores should be formed at that island. From this position they will no doubt endeavor to make their way to Baffin's Island or Port Leopold. It will therefore be your duty before
 leaving,

H.M. Ships Resolute and Intrepid
in Barrow Straits Cape Cookham
N.B. 20 miles. 8 May 1854

The Crew of H.M. Ship Resolute and Intrepid
will leave their ships to go on the 8 days of Belcher
at Beechey Island between the 15th and 25th of
May 1854. The loss of the ship ^(Intrepid) will be
south of the island. The ship will not be found in her present position.

H.M. Ships Assistance and Pioneer
wintered 1853-54 on the east side of Wellington
Channel 50 miles from Beechey Island.
"North Star" wintered in 1853-54 at Beechey Island.
The steamers and transports will prove and
reach Beechey Island last year, and
return home again.

The provisions ^{at Beechey} will be seen by the
accompanying return are sufficient to
last 50 men for more than three years.

What ship will be left out, or where, I
cannot say, or whether there will be any.
But there is an excellent docked boat, the
"Mary" at Beechey, and Sir James Ross
left his steam launch (through them) at
Port Leopold. There is also a boat at Cape
Belcher and a small ice boat. Belcher
will have with him a boat which will be ample
for a crew of 50 persons to reach the whalers.

Since a vessel without a crew she
cannot be hauled on shore (Mr. Admirally
orders to Sir Lord Belcher. Copy accompanying.)

Since the date of my arrival at Bealy
Marguati last (53) Nations have been seen
at.

at Dundas Harbour, a small Port, near Cape
Hazard on the North shore of Lancaster Sound.
They have seen a Detachment with them, which leads
to the belief, that they had found a new
place, where the Depot at Anahood is
located.

I have much pleasure in being
able to state, that with the exception of one
man who is now ill, on board, but leaves to-
day, the whole of Lieutenant's Crew have
reached Beechey Island, another stage in
their journey towards England.

The devoted Belcher is informed that
that he expects two Pleasures this year.

Whichever may reach this home will
naturally consider the time of year.
before he leaves. If he cannot reach Beechey
by the 20 August, he will, I suppose, send
ship leaving for England.

Beechey Island for wintering has
these advantages, ample Food, Provision
Meats & good Clothing.

Greatly pleased that Lieutenant
have the above advantages, with abundant
an unlimited supply Fresh Meat.

Ammy K. M. M. Captains

Key Point, Bathurst Island.

Resuming the narration of our landing at Hotspur point, I may say, I proceeded along the shore on foot to Key point, observing on our way a number of horns of deer, clearly showing that Bathurst island sustained animal life. Polar ice was massed at Key point about 75 feet high, showing that in its descent from the polar sea, in large fields, it had pressed against the projections of land on Bathurst and Melville islands, and had remained there for three or four years, as the polar ice was undoubtedly of that age. I ascended a prominence near Key point, and saw a great expanse of polar ice to the north, and became convinced that any further progress in that direction was impossible. I went inland for some distance, ascending all the time, until a height of about 600 feet was reached, and from this height had another view of the ice between the islands, which confirmed the fact that we could proceed no further northward. The land along the west coast of Bathurst island ascends in terraces inland until it reaches a considerable height.

Object of Proceeding North of Melville and Bathurst Islands.

If it had been possible to navigate the bay between the northern parts of Melville and Bathurst islands out into the Arctic ocean, an attempt would have been made. The bay had been traced on both sides and the headlands named, but no soundings nor survey of any kind had been made of the centre, and, to have obtained the depth of water for the first time and some knowledge of the tides setting into the bay, would have been a sufficient reward for even a hazardous voyage. Success point, Bathurst island, was a well known rendezvous of Sir Edward Belcher's parties in 1852-3-4, when the *Assistance*, wintered at the northern part of Grinnel land; Finlay island, north of Bathurst island, had been partly surveyed, but the sea, to the northwest, remains unexplored.

The *Arctic* was in a good seaworthy condition and her great strength as a ship, induced confidence in her power to reach a high latitude in the polar sea, provided, it came within the bounds of reason, to attempt a passage northwest. I could



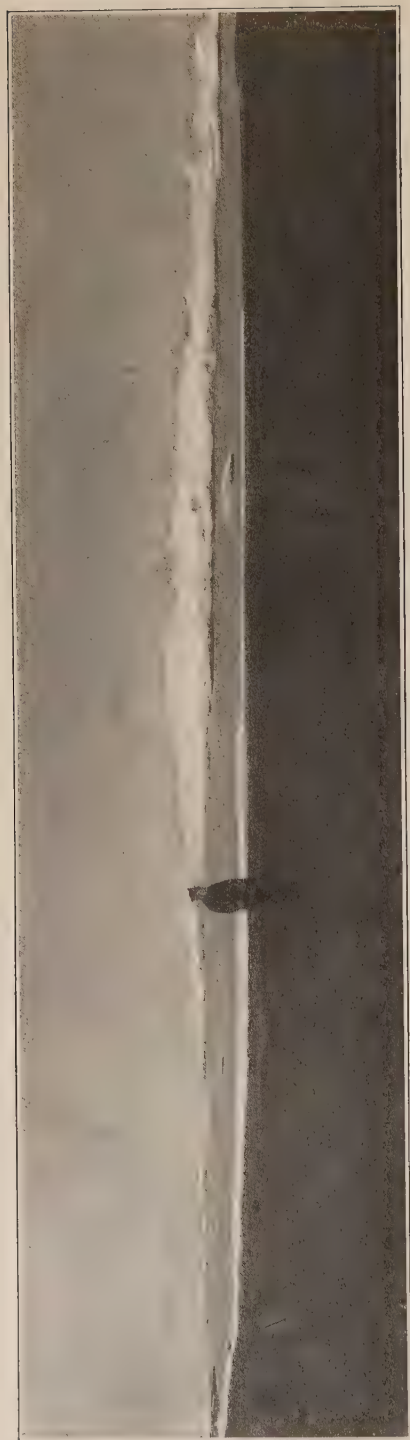
Farthest North Cairn, placed at Key Point, by Capt. Bernier, in 1909. Containing record of "Arctic" Expedition.

hardly express my sense of disappointment, when I viewed a vast expanse of heavy, aged ice, presenting an impassable barrier.

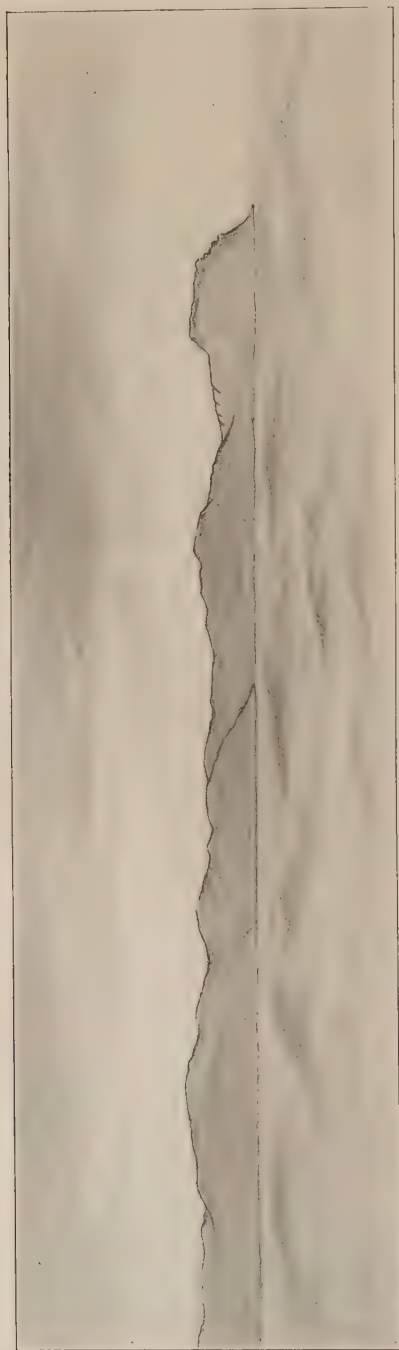
An extended study of polar sea ice, has been made by Prof. Otto Peterson of Stockholm, President of the International Commission for the study of the sea. As a result of his inquiry, he found that sea ice melts below zero and begins to show signs of melting by contraction far below zero. Even fresh water ice, formed by melted snow containing impurities, will contract before the actual melting into liquid, begins. I had reason to hope that the disappearance of ice under the various melting processes, namely the effect of the sun's rays and the contraction of ice in summer, influenced by the tides and wind, would furnish openings into which the Arctic might enter with safety. There was no sign of the ice pack slacking and running abroad, and the *Arctic*, although stable and strong enough to withstand a heavy nip, has not sufficient power to force her way through pack ice of the nature which filled the basin between the two islands mentioned, nor did the expanse of similar ice to the north and west, encourage any hope whatever of making a successful passage to a region beyond, possible.

If time had not been limited, by instructions to patrol the waters frequented by whalers south, a delay at Key point might possibly have been rewarded, but of this I am doubtful. All kinds of ice coming under the category of terms applied to polar ice, were to be seen. Extensive hummocks formed by thick cakes turned up at all angles, with interspaces filled with fresh water ice from melted snow, large fields here and there comparatively level but chequered with smooth icebergs, formed in the sea, and again large masses of piled ice cemented by the frozen sea water, comprised the scene before us.

The action of tides and winds, moving this irregular mass, grinds and forces immense bodies upon the shores of the northern islands, and these masses can be compared to nothing less than precipices along many parts of the coast. An icebreaker, of great power might, in time, cut a channel for herself from our mooring point and by drifting and cutting where possible, penetrate to the polar sea. The sequel of such a passage would be added knowledge of the geography of the polar regions and



Ice Pressure at Key Point, Bathurst Island.



Cape Dungeness, Bathurst Island.

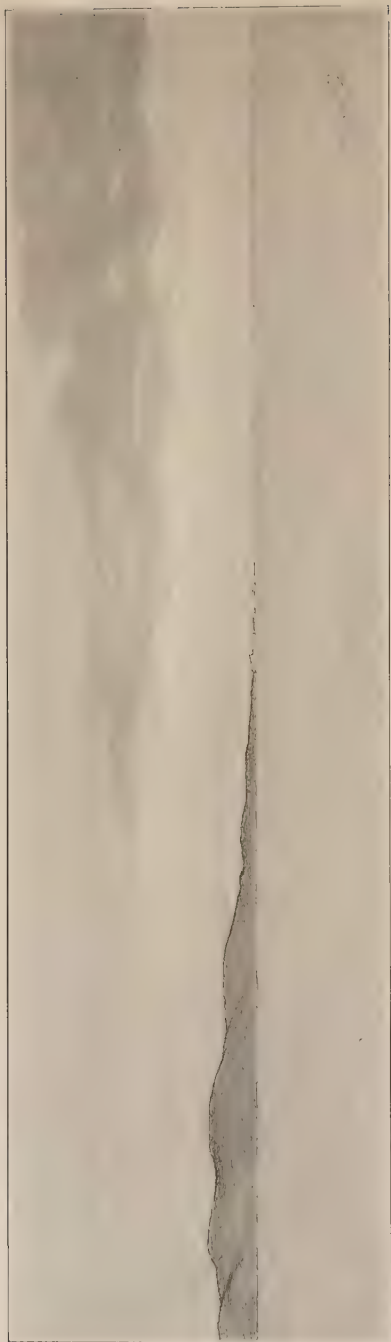
natural ice phenomena, and the conditions governing the movements of so vast a body of ice.

Austin Channel.

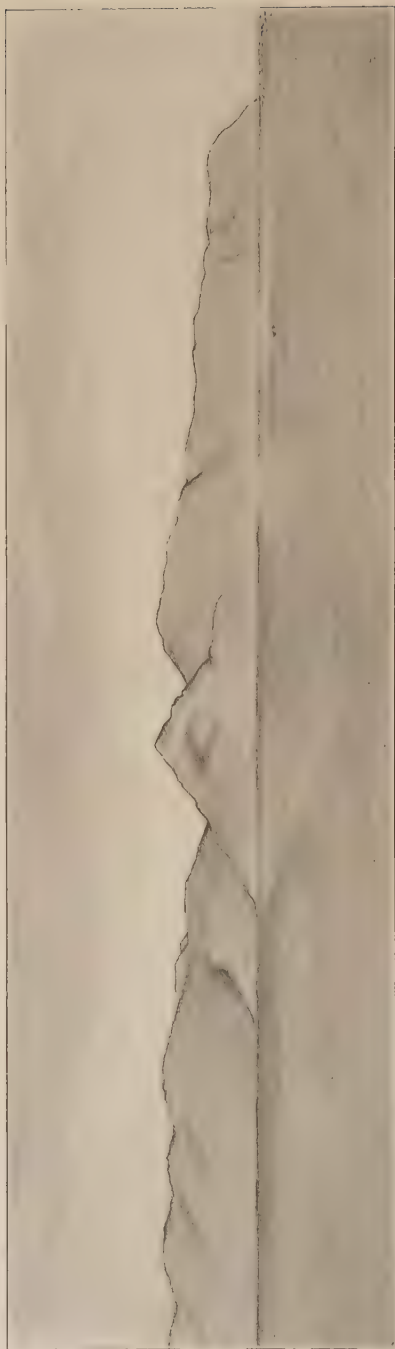
Returning to our vessel, which had been safely moored to the edge of the polar ice, we made sail, going down Austin channel towards Cape Cockburn on Bathurst island, taking soundings at every opportunity. On our way, we passed Schomberg point, a very fine head land. On August 22, Cape Cockburn was passed 3 miles off, and we steered for the outside of Moore island, and at 9.30 a.m. were half a mile south of the island. We took soundings all along the coast from Cape Cockburn, and found the water shallow until we arrived off the eastern part of Moore island. We were obliged to take in sail and shape a course towards Baker island. The ice pack was 20 feet thick, and it was impossible for us to pass through it; the vessel was therefore made fast to the ice, and soundings were taken every hour, finding from 38 to 77 fathoms. At this juncture, we had to alter our position to clear Moore island, towards which we were drifting. On the 23rd, we cast off and moved out to prevent being closed in by the pack. The wind changed to the southeast, and we took a westerly position near Garret island; we then passed Moore island 4 miles off. We steered according to the lead, and worked towards Browne island, which was reached at noon on August 23, in latitude $74^{\circ} 75'$ north, longitude $95^{\circ} 44'$ west. From this point, we steamed through a lead and made fast to the ice attached to the shore between Browne island and Somerville island in 95 fathoms of water.

Ebb and Flow of Tide.

The ice now came from the southwest, and by its movements we were able to observe the directions of the tide off Browne island and Somerville island. The ebb ran to the east and the flood tide to the west, closing us in between the ice and giving no time to escape. On the morning of August 24, the ice began to loosen, enabling the ship to go ahead towards Ross point, where we made fast to land ice in latitude $74^{\circ} 30'$ north, longitude $96^{\circ} 24'$ west. Here fresh water was taken in from a



Cape Kennedy, Bathurst Island.



Cape Hotham, Cornwallis Island.

heavy ice floe, about 50 feet thick, two miles north of Browne island, the soundings being 47 fathoms. The wind was from the east and the weather was clear, enabling Mr. Jackson to take magnetic observations on the ice.

Walrus and beset off Griffith Island.

Our first sight of walrus occurred on the night of the 24th. The ice surrounded us closely all the time, making it difficult to proceed. I determined to find a way out, and went up to the crows nest to look for a passage that might lead us clear. I stayed there all day, leaving the first and second officers to work the ship, according to the directions which I was able to give from my point of vantage. At noon, we were off Somerville island, and I could see Griffith island about 11 miles away. On August 26, we were beset off Griffith island. An attempt was made to proceed, and we managed to get to the southwest end of the island, but could not pass through and were compelled to go out again into the pack to prevent the vessel from going ashore. The whole Strait was one mass of drifting ice from shore to shore. Griffith island is a limestone island, and the ship was close enough to take photographs of it. We could see plainly Cape Walker on Russell island to the southwest. Finding it impossible to make headway, our time was occupied in taking in a supply of fresh water for the boilers and ship's use. At 3.10, on the morning of the 28th, the sun rose clear and the weather was fine; the ice began to loosen, leaving little lanes of water, through which I was able to direct the ship from the crows nest, until we had reached, at noon, latitude $74^{\circ} 34'$ north and longitude $94^{\circ} 45'$ west, in 77 fathoms of water. The vessel was completely stopped by the ice jam, apparently caused by the ice swinging around the island and grounding at some point.

The opening of navigation, around Griffith island, was some days later in 1909 than in the previous year. At the same date in 1908, namely, August 28, we were entering Winter harbour, which was free of ice and none in sight. We passed Griffith island and saw pack ice, but there was sufficient room in the Strait to allow the ice to move freely with the wind and leave clear water around Griffith island and south of Cornwallis island.

I may here safely express the opinion, that the water of Griffith island and vicinity may frequently be blocked by ice coming from the north, through Wellington channel, and being forced between Cornwallis island and Griffith island, this ice remains there until the ice from the west passes eastward or makes sufficient room for it to go eastward. There was more open water, both east and west of Griffith island, at the time we made our passage going west and when we were returning east than immediately around the island.

On August 29, the ice eased off; we proceeded at 8 a.m., and worked through under the land toward Cape Hotham, Cornwallis island, and passed the cape shortly afterwards; our latitude at noon being $74^{\circ} 35'$ north, longitude $93^{\circ} 30'$ west, Cape Hotham bearing north, 5 miles off. Large fields of ice were met coming down Wellington channel. Cape Beechey was now in sight right ahead; we passed it at 4 o'clock in the afternoon, and took our course towards Cape Crawford, meeting very little ice.

Navigation of Wellington Channel by Sir John Franklin.

From accounts published respecting the search for Sir John Franklin, it appears traces were found by Sir Leopold McClintock of the unfortunate explorer's voyage. Franklin's instructions indicated that the Northwest Passage was impossible between Melville island and Banks island, but I am confident, from my own observations, that the conclusion of the Admiralty was erroneous. The fact that McClure had navigated the waters all around Banks island in 1851-2, and that the *Arctic* could, without difficulty, have reached Banks island in 1908, and could have proceeded along the west coast of Banks island, perhaps to Herschel island, the common rendezvous of whaling vessels from the Pacific coast, leaves no doubt in my mind that the Northwest Passage is feasible in a favourable year. My purpose here, however, is more to refer to the navigation of Wellington channel, the mouth of which the *Arctic* was crossing on her return eastward. Several references have already been made in this report and my former report to the discoveries made of relics of Sir John Franklin's wintering at Erebus bay, on his way up Wellington channel. He ascended as far north



Entrance at Port Leopold, Prince Regent Inlet. Photograph taken in 1909.

as the upper part of Penny strait and returning by the same waters, crossed Barrow strait, descended Peel sound and Franklin strait to Gatehead island, between the southwest coast of Boothia peninsula and southeast coast of Victoria island, where Sir Leopold McClintock in the *Fox* found so many traces of the heroic explorer; where Lieutenant Hobson of Sir Leopold's expedition found the document, which so tersely told the sad tale, of the death of the brave man, whose fate awakened the greatest interest of any explorer of modern times, or perhaps in all history. American, French and Danish navigators headed both government and private expeditions, to show their sympathy for the Lady who never despaired of finding some proof of the last efforts of her husband, to carry out the mission to which he had so tenaciously adhered.

Open Water.

The wind began to increase, and the ship commenced to roll for the first time since the previous year, and this induced an agreeable sensation to the seamen on board who found themselves in their element.

We had been 366 days occupied on shore and in land excursions and difficult crossings on the strait, where various kinds of travelling on foot had been met, but always with a sense of walking on terra firma; now the roll and pitch of the ship made the sailors sensible of the fact that their old and more congenial work had returned.

At noon, on August 30, our latitude was $73^{\circ} 58'$ north, longitude $84^{\circ} 23'$ west, and at 5 p.m. we passed Cape Crawford, 3 miles distant; near midnight Cape Charles York was passed. The wind was strong from the southeast, but the moon was shining full and clear, and from our ship the sight was unusually grand. Dark clouds were massed behind the Byam Martin mountains on Bylot island; the mountain peaks mantled with snow presented a variety of fantastic figures, the sides rugged and black, contrasted with the white peaks, and the dark blue water reflected the moon's rays in a path that reached to the rocky shores.

On the 31st, Adam island was abreast; a strong gale from the south prevented us from steaming to the island,

we, therefore, were compelled to tack among the icebergs, under close-reefed sails, to weather the squalls, which were heavy at times. Wallaston island was now bearing east-southeast, 3 miles off; at 4 p.m., we set double-reefed mainsails, but at 6 p.m. the wind changed to the westward and we proceeded through Navy Board inlet.

Glaciers.

The sun was beginning to set below the horizon for a short time at this season, but we had daylight for the twenty-four hours. At midnight, four glaciers were passed, having the appearance of four frozen rivers, running from a height of land of about 600 feet with higher land back of it. There is more freezing than thawing in that latitude, and the glaciers ever tending towards the coast line, discharge into the inlet.

Navy Board Inlet.

On September 1, the weather was hazy, and rain was falling as we were passing through the strait or inlet. Off Low point, an island was observed, about one-quarter of a mile long, which was not marked on the chart. On the opposite side a little further south, we saw the cairn that had been built on the previous voyage of the *Arctic* on a place named Canada point, after the fishery cruiser *Canada*, the first gunboat. Several icebergs in line were seen, all touching on the bank of the western shore of Bylot island. The shore is shallow, and dangerous for strangers, and should be given a wide berth. An incident occurred which delayed us a short while on our way to Albert harbour. While we were under full sail, the pins of our wheel chain gave out from their worn state, but we overcame the difficulty by shipping the other gear temporarily.

Two Boats Sighted.

In the evening about 7 p.m., two boats were sighted pulling towards the steamer; the vessel's course was changed to meet them. The men were natives from Salmon river going to

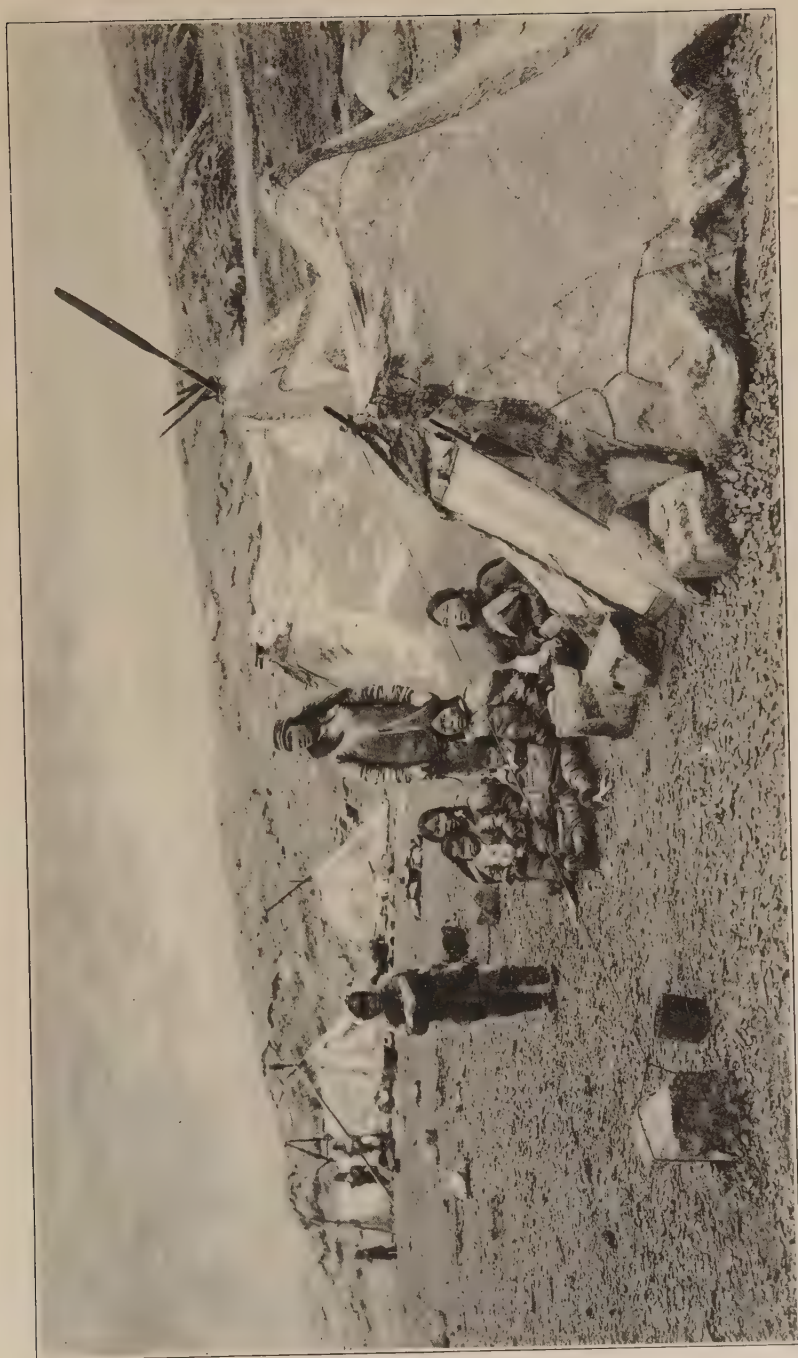
Albert harbour. These were the only human beings that the ship's company had seen since leaving Etah in Greenland on August 19, 1908. We took them on board, and proceeded to Albert harbour, where the anchor was dropped at 9.15 p.m., in 20 fathoms of water.



Albert Harbour, Ponds Inlet.



Ice Breaking up in Ponds Inlet.



Eskimo Village in Ponds Inlet.



Man and Wife, Natives of Ponds Inlet.



Eskimo and Igloo, Albert Harbour, Ponds Inlet.



Crossing from Albert Harbour to Bylot Island. Smooth ice.

CHAPTER XI.

Receiving Mail at Albert Harbour.

Immediately after arrival, the second officer was sent ashore to obtain the mail, for which we had made arrangements to be delivered at Albert harbour, by the Dundee whaler *Morning*. Through the kindness of Robert Kinnes, Esq., of Dundee, Scotland, the owner of the *Morning*, our mail had been conveyed to his whaling station at Albert harbour. No whalers were at that time at the station, but it was in charge of a native woman named Arrah, who delivered numerous packages of letters and papers. The news was in all cases of a pleasing and satisfactory nature, with the exception of a letter received by the third officer, which contained the sad information of the death of his mother.

We spent a day on shore accompanied by the natives. Mr. Jackson, who had a commission relating to the payment of customs duties by vessels trading, made inquiries respecting the arrival of these ships. Mr. McMillan gave his time to the examination of rocks in connection with geological research.

I learned from the natives, that no other vessels were expected at Albert harbour, and I decided to go south. In the meantime intending to continue our expedition along the coast, and of course, unable to conjecture what might occur in respect of accidents or being frozen in, we left letters at Albert harbour, to be conveyed by whaling vessels via Dundee, to the Department of Marine and Fisheries at Ottawa.

We left Albert harbour on September 3, passing Beloeil island, named last year; we were soon opposite two small islands, which we marked on the chart.

Erik Harbour.

Erik harbour not being on the chart, is here described for the benefit of mariners. The harbour is about 5 miles wide at its mouth and 6 miles in. Glaciers discharge in Erik harbour,



"Arctic" anchored in Albert Harbour, July 28th, 1907,



Peak on Belu'il Island Ponds Inlet.



Erik Harbour, Ponds Inlet.

making it unsafe to winter in or anchor there in summer. We steamed towards Cape Weld, noticing five glaciers together, before we reached the cape. The coast was dangerous owing to icebergs, which formed a line aground hiding the land from view, so that it was seen only occasionally. We had 240 fathoms of water in latitude $71^{\circ} 32'$ north, longitude $70^{\circ} 30'$ west. The imminent danger made extraordinary care necessary, and I was on deck all day and all night. It cleared at times for a few minutes, but set in thick again.

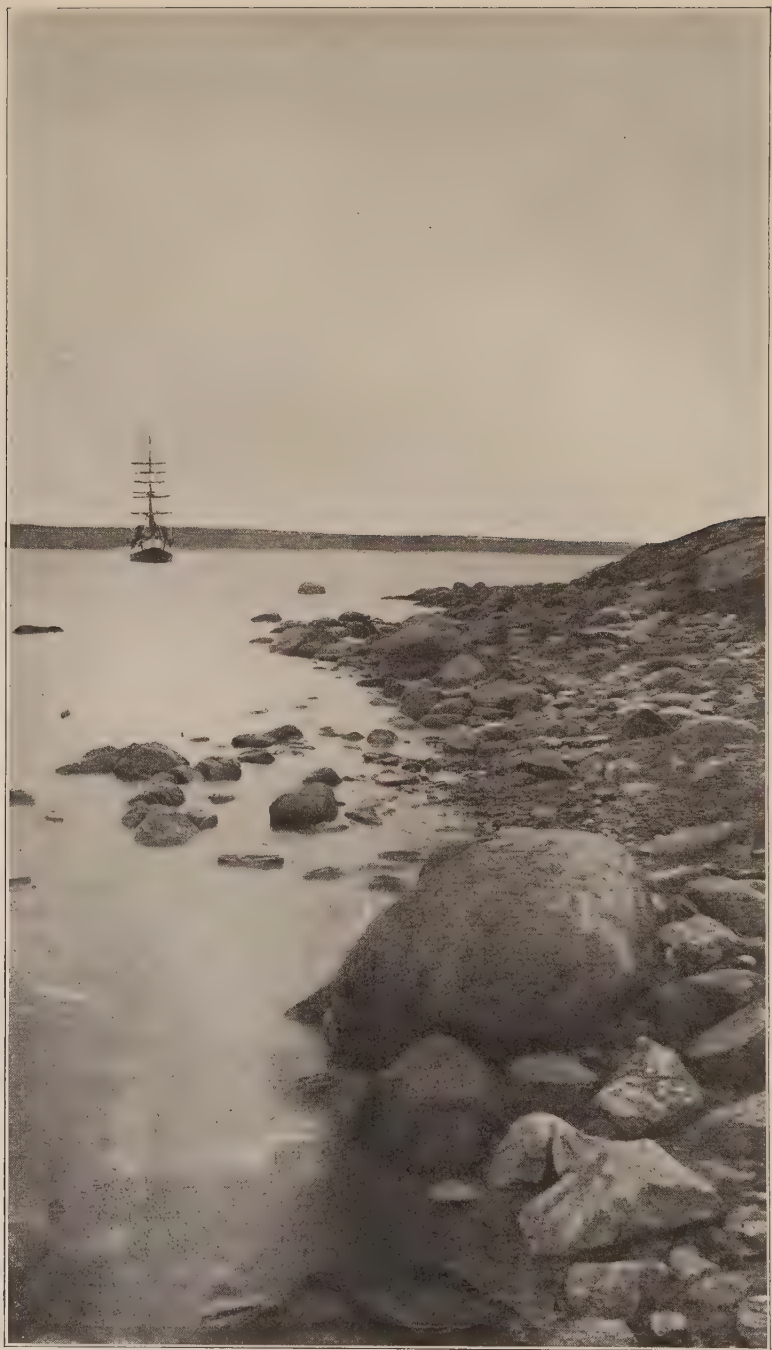
On Sunday, the 5th, land about Scott's inlet was sighted, 14 miles off. The coast for 5 or 6 miles east of Scott's inlet is low, but Agnes Monument island is a high peak covered with snow, and at 7 p.m. we passed inside the island and entered a large bay in Clyde river, which runs west-northwest, and anchored in the bottom of the bay, alongside of the whaling schooner *Jennie*.

Schooner 'Jennie.'

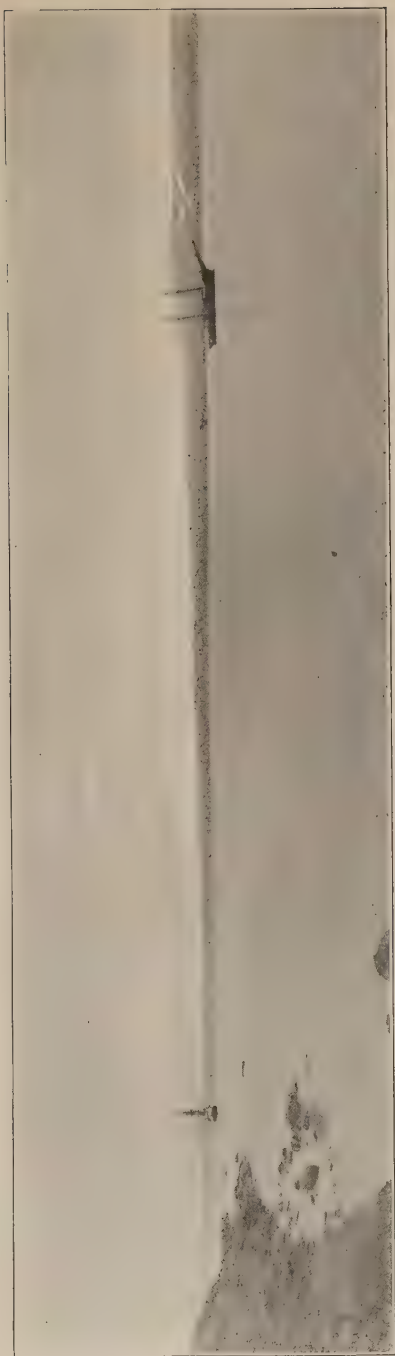
I sent the second officer to get the name of the schooner, and at the same time present my compliments to the captain, who turned out to be Captain Samuel Bartlett. The schooner was chartered by Mr. Harry Whitney, of New York, for a hunting expedition, and had just returned from Ellesmere land, where musk oxen and bears had been killed. At 1 p.m., Captain Bartlett, Mr. Whitney and Mr. Fuller came aboard, and the captain handed us mail matter from Ottawa, which he was good enough to bring with him on his voyage, with the expectation of meeting us.

I informed Mr. Whitney that I was patrolling Canadian waters, and, as he had on board his vessel a motor whaleboat, it would be necessary for him to take out a fishery license, and that I would issue it. He stated that if it was a regulation, he would pay the legal fee of \$50, and take the license. I accordingly issued the license and received the fee. We exchanged a quarter of musk ox meat for some magazines furnished by Mr. Whitney.

At daylight, we landed for the purpose of allowing Mr. McMillan to make a collection of natural history specimens



"Arctic" anchored in Clyde River, Baffin Land.



The "Arctic" and schooner "Jennie" in Clyde River, Baffin Island.



Bear killed at sea by Captain J. E. Pernier, in September, 1909.

and to pursue the search for minerals or in geological research, and for Mr. Jackson to make magnetic observations.

Patrolling the Coast.

I could not get any information respecting the whalers at their usual resorts and stations, consequently I determined to follow the shore in search of them with a view of enforcing the whaling regulations. On September 7, with all sails set, we proceeded along the land. We passed Bute island, observing everywhere icebergs aground along the coast, giving us the assurance that we were in no danger of going aground so long as the vessel was kept outside of them. At noon, we were in latitude $68^{\circ} 37'$ north, longitude $64^{\circ} 23'$ west, with wind fresh at times from the north and the weather foggy. Side lights and masthead lights were put up for the first time since last season when we were then going north. Deep sea soundings were taken during the night, and at 4 a.m., Cape Searle was made. At 6 a.m., we clewed up the sails and made for Searle harbour, which we entered, and were fortunate enough to find our friend Captain Cooney, of the yacht *St. Hilda*, of Southampton, England. He took a whaling license, and gave me an order on Mr. Kinnes, of Dundee.

Mr. McMillan, still anxious to get on shore to pursue geological searches, had with him a boat and crew which upset on the beach. As they appeared in danger, a boat was sent from the *Arctic* and another boat from the *St. Hilda*, to rescue them. Fortunately no serious trouble occurred, and Mr. McMillan came on board the *Arctic*.

Search for the 'Snowdrop.'

While at Albert harbour, among the letters received by me was one from Mr. George Taylor, of Dundee, requesting me to search for the whaling schooner *Snowdrop*, from which no news



"Arctic" entering Kekerton, Cumberland Gulf.



Mulkdynak Island, Cumberland Gulf.



Blacklead Coast.

had been received since starting upon her voyage. A sharp lookout was kept for the schooner, and inquiries made of Captain Cooney and other whalers, but no information could be given by the whalers, nor did we see the *Snowdrop* or any of her crew.

I afterwards learned that the *Arctic* was seen by a boat's crew belonging to the *Snowdrop*, but they escaped our notice.

On the 8th at 11.30, we left Searle harbour, and passed the outer head, going south. It was calm, but a heavy swell was on at the time; this was followed by light north winds. All square sails were set and forcing the vessel along, passing many icebergs, in snow squalls, making a constant watch by the commander necessary in navigating the ship and compelling us to take in sail. We were now crossing the Arctic circle. At 3 a.m., on the morning of the 9th, it cleared; the wind came from the north and we set all sail, passed Cape Walsingham, a bold cape, with an island at the end which was not on the chart, and a rock 5 miles off the headland not on the chart either but very dangerous for vessels. We steered for Cape Mercy, and began to meet Cumberland gulf ice and old floes. At 10.40 a.m., we passed the remarkable island called Wareham, peculiar in shape and height. Ice was met, and we had much of it to contend with. At 6.30 of the 10th, we were outside Kekerton station.

Issuing Whaling Licenses.

Mr. Jackson, in his capacity of customs officer, went ashore, and came back on board with the agent of Kekerton station, and to the agent I issued four whaling licenses, one each for the years 1906-7-8-9. I then left Kekerton station, taking the agent with us on our way to Blacklead.

At 4 a.m., on September 11, our voyage was resumed. By 10 a.m., we reached Blacklead harbour and dropped anchor.



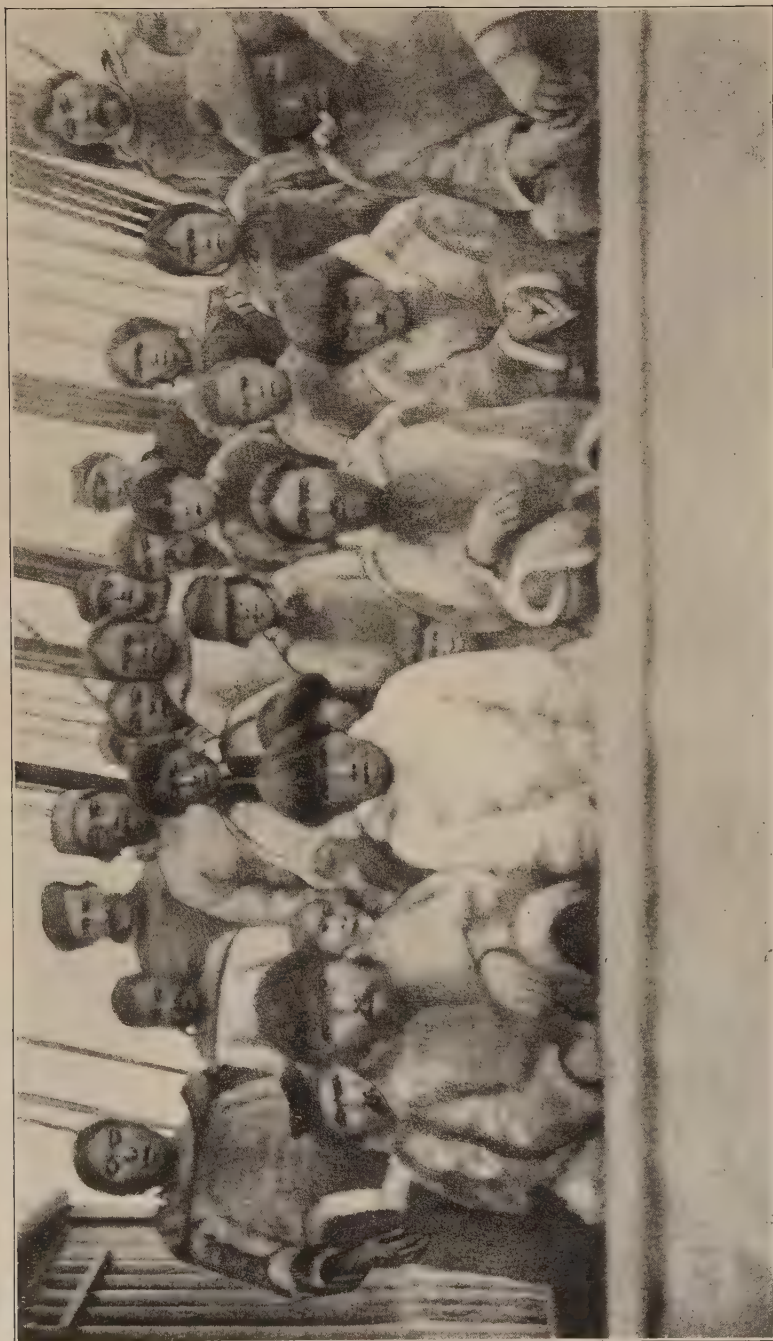
Whaling Station, Blacklead Island.



Eskimo Women, Blacklead.



Eskimo at Blacklead Holding Bibles in Native Language, in their hands.



Eskimo at Blacklead.

At this place, Mr. Warrender, an agent of Mr. Crawford Noble of Aberdeen, gave me information regarding the harbour. I here acknowledge his kindness and attention during our stay. Mr. Jackson, Mr. McMillan and Mr. Vanasse landed to attend to the particular work each had in hand. I took several azimuths for variation, finding it 61 westerly variation at Black-lead, and the latitude $64^{\circ} 49'$ north, longitude $66^{\circ} 25'$ west.

Several Eskimos came on board, and during the day when opportunity arose, questions were asked them respecting whalers in the outlying harbours and waters. Two meals were furnished them in return; it is needless to say they were enjoyed by these people, with their usual relish of food. We hove anchor at 5.30, and made our way to sea. On Sunday, the 12th, the wind came from the north; we set all square sails and passed along an unsurveyed coast with many islands. We reached latitude $63:54$ north, and longitude $64:05$ west; shortly after, the ship passed abreast of Anderson channel, 3 miles off; the same afternoon we passed Cape Murchison, and noticed that one small island off the Cape had been omitted from the chart of these waters.

At Cape Haven, we hove to, and looked for the crew of the *Snowdrop*. Four seamen and myself started in an open boat towards the harbour and reached the southwest arm, going as far as possible to the inner end, but did not see anything of the missing men. We then searched for cairns or a house, but were unsuccessful in both the eastern and western arms; then we returned on board. Our next point was Hall island, for which we steered; while opposite the eastern end of Hall island we saw three small islands not marked on the chart. At noon, we were in latitude $62^{\circ} 43'$ north, longitude $64^{\circ} 2'$ west, and were steering for Resolute island. A strong wind was blowing from the north-northwest all night, and we passed a large number of icebergs aground.



Unsurveyed Coast South of Blacklead No. 1.



Unsurveyed Coast South of Blacklead No. 2.



Unsurveyed Coast South of Blacklead No. 3.



Unsurveyed Coast South of Blacklead No. 4.



Unsurveyed Coast, South of Blacklead No. 5.

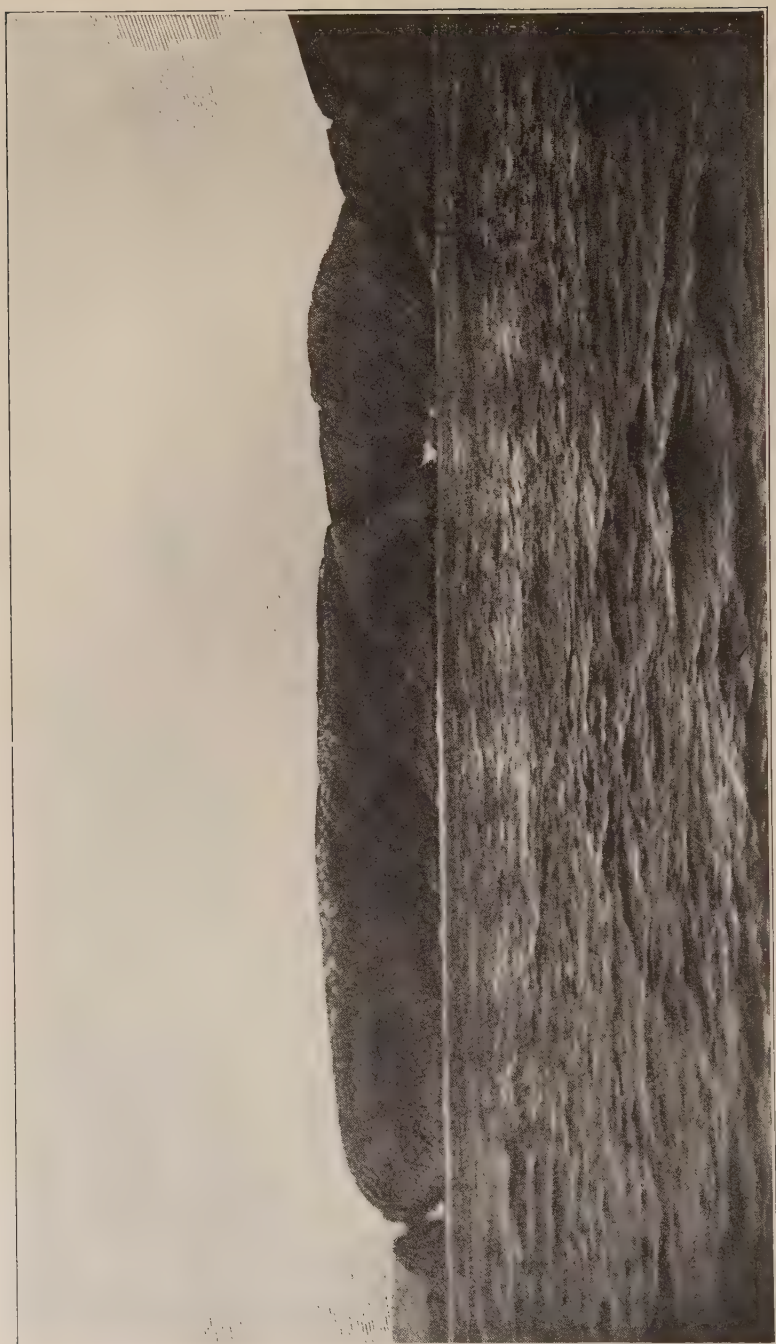


Unsurveyed Coast South of Blacklead No. 6.

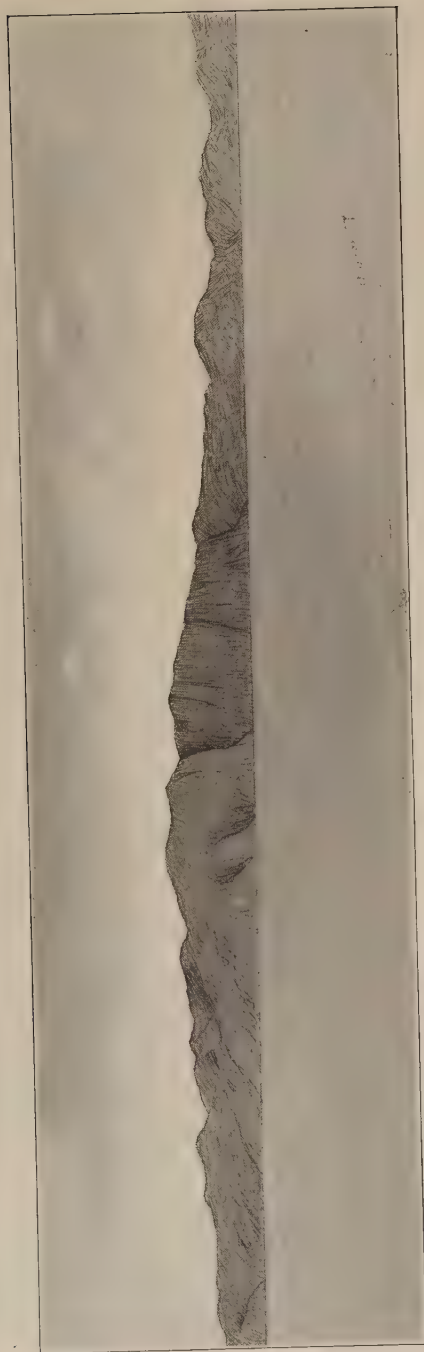
Button. Islands.

At 5 a.m., on September 14, Button islands were sighted, 5 miles off, but the wind being very strong from the west, we had to sail by the wind and against the tide; we were unable to make headway, and were forced to leeward of Button islands. When our vessel was two miles to the eastward, I noticed a ledge breaking at times, three miles south-southeast from the northeast outermost island. The reef is not marked on the chart, but should be, as it breaks only during very heavy weather and is a very dangerous reef on that account. We, however, steamed head to wind all night and got around the Buttons.

There are 22 islands in the group, but only 10 are marked on the chart. At daylight, on the morning of September 15, we were in sight of Port Burwell. The tides are very strong around the Button islands, and vessels should avoid being near the coast, especially if they are slow.



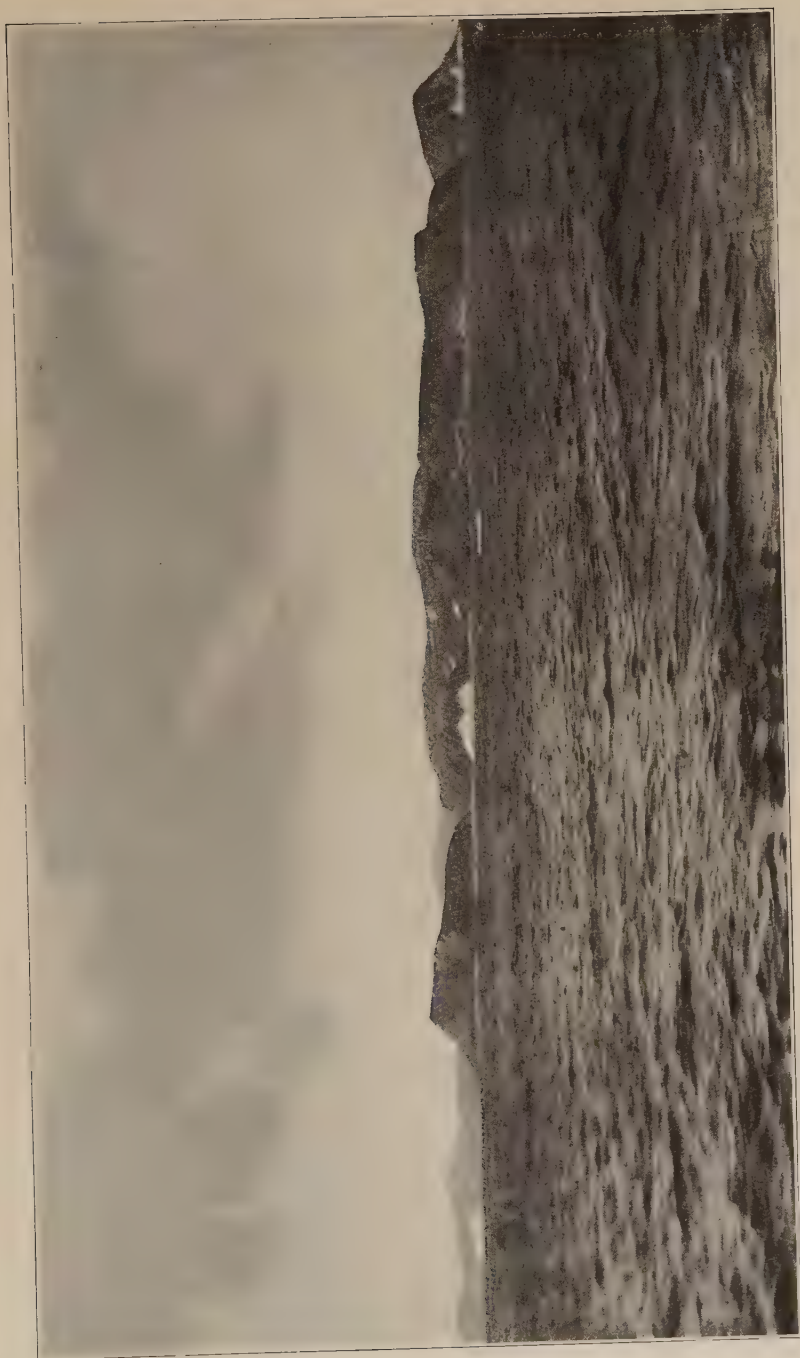
Cape Murchison, Baffin Island.



Point North of Cape Haven, Hudson Strait.



Iceberg off Hall Island, Entrance Frobisher Bay.



Hall Island, Northern Entrance Frobisher Bay.



Moravian Church Mission, Port Barwell.

CHAPTER XII.

Port Burwell.

At 8 o'clock a.m. of September 15, we anchored in the centre of the harbour of Port Burwell in 14 fathoms of water, and, at noon, I paid an official visit to the Moravian missionary station in charge of Mr. Seaman.

Part of the men of the *Arctic* were told off to go fishing for codfish and two parties to furnish fresh water.

It rained the whole day but the sea was smooth, enabling me to work at observations of the place and examine the beacons which had been placed in 1907; they were found in place and in good condition. Our men brought on board 142 codfish.

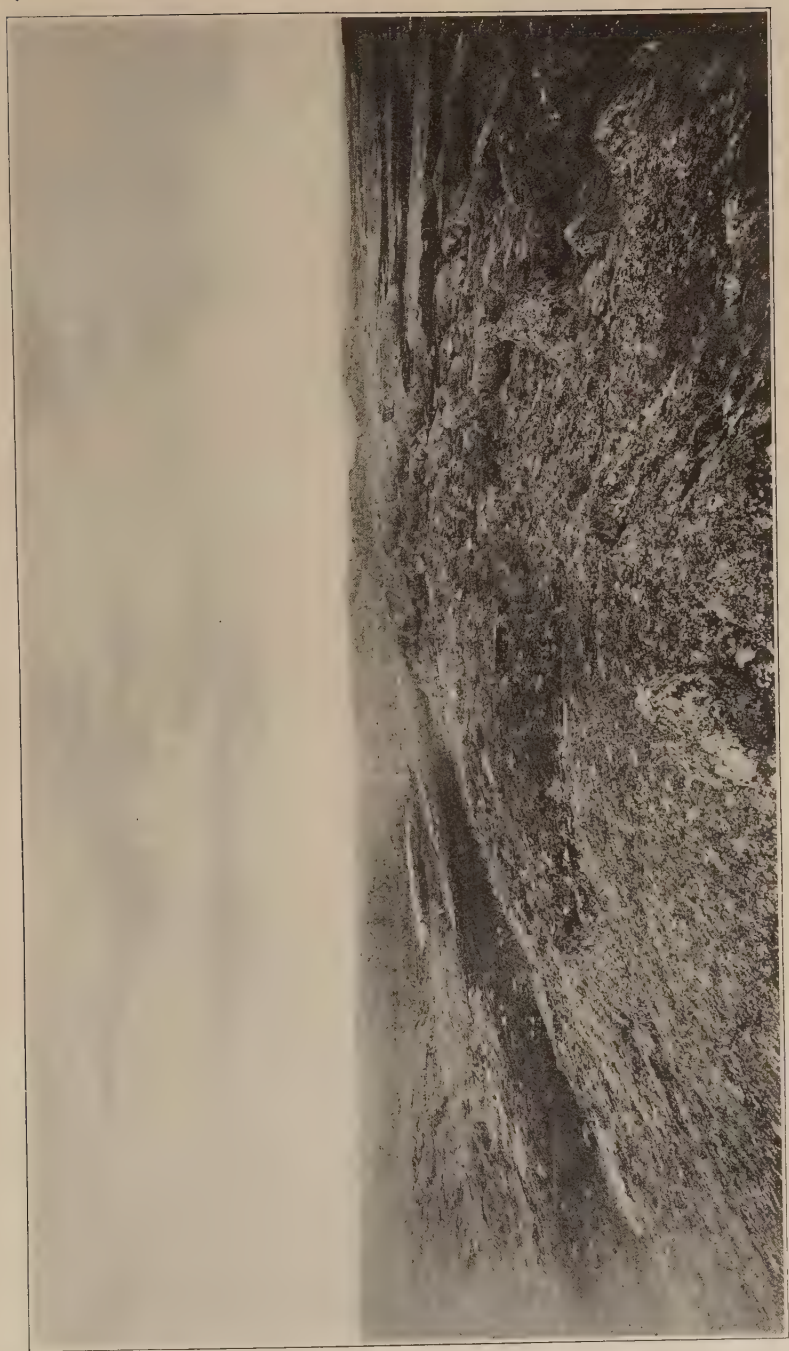
The difficulty of making the part of the voyage from Cumberland gulf was due to heavy weather; for the safety of the vessel and all on board, I remained on deck fifty hours. Our arrival at Port Burwell enabled me to get some rest. Mr. Jackson went to the spot to take observations, where Mr. Burwell had observed in 1884.

A friendly visit was paid to the Moravian missionary station, and while there, I took occasion to pay the rent for stores left in the charge of the missionaries in 1907; the payment was made to include the time up to October 1, 1910. The missionaries courteously returned my visit, and dined on board. It is due to these excellent men, to bear testimony to the great good that has been accomplished amongst the Eskimo. They have treated the unfortunate Eskimo in a most Christian manner, have civilized them, taught them industrial arts and to read and write. They have elevated them by abolishing bigamy, inculcating honesty, cleanliness of habits and of the lives of the people.

We took on board water and ballast; landed five cases of pemmican and five cases of bovril to add to the stores already left at Port Burwell, for the use of any vessels in distress that



Chief Amawalik and Party from Igloodik.



Top of Baffin Island. Taken at Port Burwell, Ungava.

might visit the place or run for it. On September 18, we left at 3.09 p.m.; the next day, the wind changed and came from the north, causing a heavy sea; we set all sail and by noon, we were by account in latitude $60^{\circ} 42'$ north, and longitude $62^{\circ} 20'$ west; wind, west-southwest; variation, 53 degrees westerly. The strait was clear of ice with the exception of a few pieces here and there, but nothing approaching field ice. On the 20th, we shaped our course to Ashe inlet, having received instructions before beginning the voyage to sail a certain distance into Hudson strait, for the purpose of ascertaining the state of navigation. The department directed me to enter on the south side of the strait and return by the north side. Soundings were taken on the way, and we arrived at the inlet at 4 p.m. on September 20; let go our anchor in 14 fathoms of water, the remains of the stations bearing east-northeast.

Ashe Inlet.

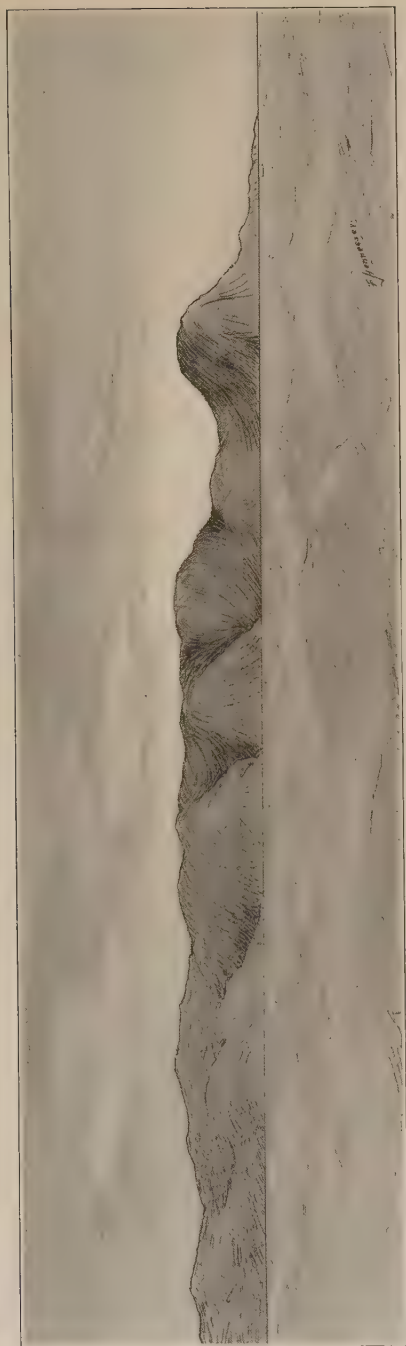
On September 21, I landed to place my records on a hill where a lookout had been established. More stones were added to the lookout, for the protection of the records which were left. Two wooden beacons were built to assist mariners in locating the harbour, and, when firmly established were marked in a way to indicate that the aid to navigation was built by the men of the *Arctic*. At noon, with a quartermaster and four men, I went to the top of the highest hill, upon which a beacon had been built by Mr. Tyrrel when connected with a former expedition. From this hill, we had an excellent view of the strait, which at that time was entirely clear of ice. Thursday a strong gale from the south-southeast made it necessary to pay out 90 fathoms on each chain; the wind increasing, we dropped over the bows two more anchors to keep the vessel steady, and steamed slow ahead with the engine. The harbour does not afford sufficient shelter from the southeast for any ordinary ship, but we held our position and got everything ready to steam full speed ahead. It was high water at 1.10 p.m., and heavy seas were coming in; at 3 p.m., it moderated and we hove up the two spare anchors. The next morning the wind was light from the southwest; the sea going down, we landed



Entrance of Ashe Inlet, Hudson Strait. Cairn on eastern side.



Beacon, built in Ashe Inlet, Fall of 1909.



Eastern Extremity of Big Island, Hudson Strait.



Remains of Station erected by Gordon Expedition in 1884.

two boats' crews and the observers, Mr. McMillan and Mr. Jackson. On the return to the ship of all who had gone off from her, we passed out of the harbour. At its entrance was a large iceberg aground, which was passed on the north side. The beacon, on the north side of the harbour, was placed there to clear a rock which covers at high water and is on the north-east side of the entrance.

The weather was clear on September 25, a light wind coming from the southwest. All sail was set; at noon, our latitude was $61^{\circ} 20'$ north, longitude $66^{\circ} 40'$ west, and variation 54 degrees westerly. We met a few pieces of ice in the morning, but no ice of any kind was visible at noon. The day continued fine, permitting us to make good headway. At 9.30 p.m., we made the Button islands, and at midnight they were bearing southwest 5 miles distant. The weather at this hour was as fine as could be wished for, continuing so the next day, the 26th, enabling us to sight the land to the westward and enjoy some evidences of civilization, and to recognize the pleasing fact that we were nearing home.

Cape Mugford was passed on the 27th, bearing northwest about 12 miles distant. The weather for two days and nights had been extremely fine, the sea free from icebergs, enabling us to pass along the coast of Labrador with ease. The weather continued fine and warm for the time of year, and the men were set to work to clean and paint the ship. On Thursday morning at 2 a.m., of the 30th, we sighted Belle Isle light from the masthead, one point on the bow. I was anxious to go through the strait while the weather was fine, and passed Chateau bay without reporting. When Point Armour was reached, however, I sent ashore the second officer to report the arrival of the *Arctic* to the Minister of Marine and Fisheries, by telegraph. The fine weather came to an end by easterly wind, which brought rain, but we crowded on sail and made about 8 knots an hour, so that by midnight on October 2, we were within 18 miles of Seven Islands light, bearing north-northwest, and the weather fine. The morning of October 3, was fine also; we began to wonder why the shipping along this shore had disappeared. The good lights on the south shore account for the change; we remained, however, on the north side, because



The "Arctic" off Labrador Coast, in a Gale. Returning.

the *Arctic* was able to take advantage, at that time, of the tide which, for a slow vessel, was more favourable than on the south side. At 8.30 a.m., we exchanged signals with Point DeMonts, a circumstance that was greatly appreciated by men who had been deprived of all communication of the kind for fourteen months. At Father point, letters and papers from our families were received from Mr. McWilliams, the Superintendent, and with feelings of satisfaction and pleasure, we learned that all at our different homes were well. We left Father point for Quebec, with a pilot on board acquainted with all the changes made in aids to navigation since our departure.

On the morning of October 4, we passed Green island light, were met by several vessels bound down the river, which recognized the *Arctic*, and gave us signals of welcome that we gladly returned. At 7.30 p.m., we were opposite L'Islet, my birth place, where some very kind friends showed their interest in our safe return from northern dangers, by bonfires at several points. We had service on board to thank a kind Providence for enabling us to return in safety and good health, without accident of any kind, to the shores that we had left. Tuesday, October 5, in the forenoon, saw the end of our voyage as we anchored abreast of the King's wharf at Quebec. Shortly after, the *Arctic* was moored at the wharf, and handed over to the agent of the Department of Marine and Fisheries, who took charge of her.

The chronometers were sent to the Magnetic Observatory to be rated, and found to be slow of Greenwich mean time. One chronometer for some reason had stopped during the winter, but the two others on board kept running. The matter of discharging stores was attended to, and I began my journey by rail to Ottawa, where I reported, next day, to the Minister of Marine and Fisheries, the work that had been accomplished on the cruise of the *Arctic* in 1908 and 1909.

CHAPTER XIII.

General Information.

Nothing of a very definite nature with regard to the fish and mineral resources of Hudson bay, Hudson strait and the Arctic islands and waters has been published. I, therefore, desire to furnish in a general way some information, relating to the natives, their habits and customs, and some knowledge of the fish, animals and birds.

It is well known that seals collect in vast numbers on pans or fields of ice outside Belle Isle strait and along the Labrador coast. During the three voyages of the *Arctic*, we went north late in the season, consequently did not see the vast numbers of seals which appear earlier on the ice floes. The account relating to mammals and fish, is confined to the numbers seen by us from the deck of our own vessel during the voyages made, and does not include knowledge which I have obtained from persons engaged in seal fishing nor by reading, nor practical experience in the industry itself.

Our course when going north was as far as possible in open water, but when we did approach the ice, we saw numbers of seals, sometimes 200 or so, of full grown and half grown sizes, lying upon the ice in the bright sunshine. They were still going north, and frequently abounded in the sea surrounding the ship.

Codfish.

The coast of Labrador is teeming with codfish, which go as far north as Hudson strait and enter Ungava bay, reaching those waters about August 1. Boats were sent out from our vessel, when at Port Burwell, and a number caught by line and jiggers. We observed them in large numbers in Harvey bay and McLelan strait. The codfish are of a local variety, that is, they are different in size, appearance and taste from the fish caught on the Newfoundland banks. They are not so large nor the flesh of as firm texture as the bank fish, but are superior

for the table when fresh, being more delicate in flavour and sweeter to the taste. It was noticed on board, that the codfish seemed to seek water coming from Hudson bay, which is warmer in midsummer than the tidal flow from Davis strait and Baffin bay. Newfoundland sealing vessels go to the waters around Cape Chidley, for the purpose of catching codfish in the summer, and extend their operations as far as Port Burwell and Munro harbour.

There is at present, around Ungava bay, and at the entrance of Hudson strait, a great opening for cod fishing by our own fishermen and, I believe, the day is not far distant, when advantage will be taken of the opening and a large trade will spring up as the result of fishing along these shores, where curing can be safely done or fresh fish shipped in refrigerators.

Salmon Trout.

Salmon trout were seen in vast numbers during our expedition in Hudson bay in 1904; in fact every large stream emptying into the bay and strait, is practically filled with these fish, and every stream would support a fishing and shipping station. When a railroad terminus is established on the western side of Hudson bay, one of the chief feeders will doubtless be the frozen fish trade. At present the natives catch and use for their diet, in summer, the salmon trout, and very often cache them for future use. The condition of the fish when eaten by the native Eskimo, is not an element which prevents him from appeasing his appetite when hungry. During the voyages of 1906-7 and 1908-9, opportunities for familiarizing ourselves with the plentiful stock of salmon trout, in northern waters, were given at Salmon river, Ponds inlet and at Robertson river in Milne inlet. The natives fish in those rivers and eat the fish raw. In this respect the native human being has not made any advance upon the seals, which remain at the mouths of the rivers and also feed upon the salmon trout.

The quality of salmon trout in Hudson bay and Labrador waters, for food, is equal to any fish found in other Canadian waters and much superior in taste, to salmon trout in Ontario or salmon caught on the Pacific coast. They average about 9

or 10 pounds in weight; are about 20 to 22 inches in length, when mature, and are what may be termed a deep fish in shape from the back to the belly.

I can hardly refrain from expressing my opinion, that an immense fish trade can be opened up with the northwest part of Canada in salmon trout and codfish, if means are adopted for conveying fish by rail from some port on Hudson bay to the great grain regions now filling up so rapidly.

Narwhals.

Narwhals were seen by us in large schools in Ponds inlet, Erebus bay, Admiralty inlet, Peel sound and more particularly Port Leopold harbour. These fish were easily approached, apparently taking no notice of the vessel; they appear to go in pairs; in colour, some are white and others grey. Nature in furnishing weapons for this mammal has supplied a long spiral shaped horn of ivory which projects from the snout, and must be effective in the struggles against its enemies. The narwhals are not so dangerous whilst being hunted as the vicious walrus. The horn is of a much better quality of ivory than the tusks of the walrus and more highly prized. Occasionally a narwhal is seen with two horns but one of them is very short and deformed in shape.

It was observed by us that the propellor striking the water disturbed the narwhals in the sea a long way off, owing to the keen sense of hearing which they possess and to water being a most excellent conductor of sound.

Walrus.

Walrus were seen by us along the Greenland coast, where they are followed by the natives, who are very expert in attacking them and have an ingenious method of keeping the animal afloat when killed, by use of skins filled with air attached to their harpoons. The greatest number of walrus observed by us were floating on pans of ice near Etah, in Greenland, and in Inglefield gulf, but no time could be given to hunting them as we were making all speed possible to land supplies for Dr. Cook at Etah, before continuing our voyage to Lancaster sound and

the Parry islands. The natives use the flesh of the walrus for food, and even eat the skin, which they cut into strips, dry, and carry with them as a dainty in their migratory movements. The whalers secure large numbers of skins and walrus tusks, which have long been an article of commerce.

White Whales.

White whales were seen at Port Burwell, where they sometimes appear in considerable numbers. They are not sought for to any extent as they are deficient in blubber, but I have known instances in which the natives in far distant parts, make use of them for food when no other kind could be procured.

Sharks.

Sharks are sometimes taken at Port Burwell in nets used by the missionaries for catching seals. The sharks become entangled in the nets, and, of course, are made use of by extracting oil, which is sent to England.

Right Whales.

Right whales were occasionally observed from the *Arctic* in former voyages, but they have become so scarce that even whalers who devote most of their time to the special enterprise of searching for whales, meet with them but rarely. An occasional right whale came to the surface, within view from our vessel, in Hudson strait, in 1904, and in the northwest part of the bay. The direction followed by them appears to be from the Atlantic by the Strait into Hudson bay, and then they proceed north to Roe's Welcome, but finding no outlet, return by the same route to the Atlantic ocean. While in Frozen strait, they are captured by those engaged in the whaling industry, principally United States whalers. The Scotch whalers leave Dundee about April 10 each year, and make for the west coast of Greenland, hunting for whales in Baffin bay and other waters as far north as Cape York, and then enter Lancaster sound; others sail into Ponds inlet, where there is a whaling station. The course generally followed by Scotch whalers, so far as our

observations went, was as described, and they also call at trading posts and secure from the natives, bear, wolf, seal, walrus, and narwhal skins and ivory, then coast along southward and return to Scotland in November.

The year 1909 was not a successful year for whaling, owing to the scarcity of whales. Two vessels fitted out for the purpose of catching whales in 1908 have been reported lost. Although the *Arctic* did not enter Hudson bay, where the whales have been apt in the past to assemble in numbers, yet whalers were heard from in our patrolling movements, in waters in Baffin bay and Davis strait. The result of the fishery became known to me and my information leads me to conclude, that the industry has almost ceased. Only one whale was seen by the crew of the *Arctic* in our voyage, therefore, I am disposed to believe that the waters are nearly depleted. Regulations establishing a close season for fifteen or twenty years might lead to the increase of this monster of the deep and restore the whaling industry.

Small Fish.

Descending from the large mammals and large fish inhabiting the northern waters to the small kinds, we saw in Winter harbour around our ship numerous small fish; in fact the water is full of fish life; conspicuous are shrimps in immense numbers which would in cases of the failure of other sources of food supply, sustain life amongst the natives.

Animals.

The animals of the northern regions are confined to a few species. The musk ox was seen in considerable numbers, and a large contribution of fresh meat for our sojourn in Winter harbour, Melville island, was secured by hunting them. They seek ravines and sheltered places during winter and appear in the open in summer, feeding at night, as the day seems too warm for these heavy coated animals to move about. The flesh was preferred by the ship's company to beef which we had on board. The animal should be skinned and dressed immediately after killing; if not, the flesh becomes tainted by the gas retained in the stomach.

Herds of reindeer roamed over Melville island, in the same feeding grounds with the musk oxen, but did not intermix. The other animals observed by us were: hares, of a large size many of which were used for food, foxes, wolves, bears and lemming.

The bears are very destructive; they were frequently seen in the vicinity of our ship, and several were killed on the ice, causing extremely exciting adventures. They are more plentiful near Cape Providence than at Winter harbour. The bears find the heavy cracks in the ice and watch for seals which make these places their resort for breathing; bruin being of the colour of the ice is not easily detected, and being expert at catching the seal crushes his skull and the mammal becomes easy prey. The bear leaves his tracks as a sort of beaten path along the edge of every crack in the ice, giving evidence of his watchfulness for the appearance of the seal. Foxes are often seen within a short distance of the bears, waiting to devour the scraps when the larger animal has made his meal.

The wolves are of large size but are very cowardly and swift in disappearing when discovered, keeping up the reputation gained wherever the animal is known. Lemming have a strong resemblance to rats without tails, and, in spring, leave their winter abode and many become the victims of the larger and voracious animals and birds.

Birds.

The birds were seen in large flocks, the most numerous being the little auk, which fills the air so thickly in its migratory movements as to cloud the sky. This was especially the case in the vicinity of Etah and Inglefield gulf. King eider ducks were seen on the lakes inland; they with their muffled heads and plumage, while swimming about, present a self-satisfied and attractive appearance.

The geese and ducks flying south in the fall and returning in the spring enlivened the scene and, at times, the great height in the air of their flight affords a strong presumption of the belief that they find their feeding grounds many miles north of

Melville island, perhaps on shores as yet undiscovered. The jaeger, was found by our exploring parties nestling and feeding its young among the immense beds of wild flowers which spring up magically, after the mantle of snow disappears. Descriptions of these birds, will be found in a report made by the Assistant Naturalist to the expedition.

Natives.

The natives have been described so often in various reports and books dealing with races, that it seems unnecessary to repeat an account of the habits and characteristics of the Eskimo. There are, however, some points deserving of notice here: among them, the difference of appearance of the Eskimo at Port Burwell who have come under the influence of Moravian missionaries, from the natives in their natural state elsewhere. The Port Burwell natives dress in European clothes, are superior in physique, morals and habits and have become very intelligent through reading books published in their own language. The Bible has been translated into their language and is very widely read; as a consequence, they have reached a much higher state of morality than any of the other natives of the northern regions. Ranking next to Port Burwell Eskimos, in intelligence, morals and decency, are the natives in Cumberland gulf, amongst whom the Rev. Dr. Peck and others, have been working; they also have houses, their children are taught to read and write and the correct habits of civilization inculcated. The Eskimo of Greenland have the benefit of the Danish Government regulations and teaching, and rank next in intelligence, morality and habits of cleanliness.

I do not feel like making this quiet and peaceable race of human beings a subject of ridicule, particularly on the question of cleanliness and morals, but believe that an earnest effort should be made by white men of intelligence who desire the elevation of native races, to improve them. In the winter, there is very little water to be seen beyond the melted snow in igloos for drinking purposes. In fact, even amongst white men of the crews of vessels in which I have been, it was absolutely necessary by firmness and discipline to make some of them pay

attention to the matter of keeping their bodies clean, and the prevention of scurvy. It seems peculiar to the northern climate to dispense with the bath.

The communication with whaling sailors has not had a tendency to improve the morals of the Eskimo, and there is now, a good opening by patrolling the northern waters and by the service of the Mounted Police, of enforcing regulations which will check the too free practice of flagrant open immorality by white men.

The natives who have been left to themselves, have made no effort to resist the ravages of disease which result from the practices introduced by white men, who make use of them for their own selfish purposes. Murders and other crimes comparatively unknown, previous to the contact of bad white men, occasionally occur amongst the untaught natives who have not the example of exemplary men. In addition to the natural state of the Eskimo, seeds of immorality and crime have been sown, and the natives are in a worse state than before the introduction of our civilization. Since the white man visited the habitations of these people, death among the children is a common occurrence; the best suited race for the cold inhospitable climes, will disappear if some strenuous efforts are not made to preserve them. The missionary with high motives and some medical knowledge, is the best instructor to send amongst them. The natives can be made useful assistants in developing the resources of the country and, furthermore, the white races owe it to themselves, as well as to the natives, to undo the evil which they have done. I cannot too strongly emphasize the duty of white men, to save a race which they have done so much to destroy. The work has been made more difficult by the adoption of the white man's sins.

The tendency of the Eskimo without guidance, is to part with the native weapons and implements, in exchange for a gun and a few rounds of ammunition, and when they exhaust the ammunition are helpless. Prudence is not one of their characteristics, and they will dispose of their ivory and weapons, which have cost them great labour to make, for a mere song to men who seek them for curiosities to furnish our

museums or to sell to curiosity dealers. Continuance of this trade, will doubtless result in the loss of the native art and skill that the Eskimo has shown in providing himself with implements and weapons, for procuring his daily food.

Amongst the characteristics of the natives, I here note a few which I have not seen described in other reports or works. The sick are numerous at Ponds inlet, disease often being brought on by eating putrid meat; boils and ulcers are the common lot of these people, caused by the great consumption of animal food. An antidote for these affections and scurvy, is a kind of native grass called scurvy grass, resembling a sour plant commonly seen in our fields; sorrel is also used for scurvy and other blood diseases.

The Eskimo seems incapable, in his untaught state, of keeping up continuous thought on one subject. One hour's questioning, for instance, about localities, headlands, bays and rivers is the limit of his intellectual endurance. I have tried, on several occasions, to get the Eskimo to mark on paper with pencil the outlines of a coast. During the difficult task the native perspires freely, cudgels his brains, requires his wife to assist his scattered thoughts, and in about one hour drops his pencil with all things absolutely a blank. In other words, his brain power is exhausted by the effort. Then another will pick up the thread where the first ended, if he has travelled the coast, and about another hour is spent in the same mental agony, when he, too, will collapse.

The chart thus produced has no resemblance to the contour of the land, but is drawn in a straight line, with the number of rivers or bays marked; no attempt, however, is made to form curves or angles nor show the geographical directions of the land. The memory is very much assisted by some particular occurrence, as for instance, eating at a certain point, or marking the direction to follow by stones, which sometimes, are laid on edge, at other times on the flat and again on the corner, another angle pointing in the direction to travel.

When ascending the accommodation ladder on the side of the ship, the Eskimo always climbed up on his hands and knees, making no use of the hand rail of the ladder. When once on deck, he shows no great interest in the objects about, but if a

sound comes from below deck, he crawls to the combings of a hatch and looks down with utter astonishment and interest, beckoning his fellows by quick motions to come and see, particularly if the men below can be seen at work.

I refer now to natives who have not before been on vessels. They were backward in approaching the *Arctic*, and in order to assure them that we intended no harm, we cried 'Tiamo, Tiamo,' understood by them that we were friendly; they then came on board. My object in getting these natives on the deck, was to question them about the coast and adjoining waters, and I found by giving them something to eat, information was easily obtained. I discovered that food was the key that unlocked the door to the Eskimo's stock of knowledge, and he at once communicated what he knew of the locality and of the land, water and conditions, prevailing at distant places visited by him.

One very distinctive trait of all the natives is a disposition to keep on shore until they are invited on board. When this invitation is given, they readily swarm on a vessel, after which they become a little too familiar, and show a strong inclination to eat oftener than a vessel's stores permit.

CHAPTER XIV.

Area of Land Annexed.

The mainland and islands annexed in two voyages of the *Arctic*, cover an area of many thousands of miles which can only be roughly estimated. It extends from the 60th meridian to 141 west and from parallel 61 to 83 north latitude. In many bays, the ice which forms and is driven in by tide and wind, remains for several years, whilst in others the ice leaves entirely during the short summer. The land becomes clear of snow except on high peaks, and the plains and valleys, where soil is located, show a heavy growth of grass on which numerous herds of reindeer and musk oxen feed, but no trees grow north of the 60th parallel.

The climate is rigorous beyond what people in other climes will endure, but in my opinion, is improving slowly. Coast lines sheltered from north and east winds are much warmer than the shores exposed to these winds. The farther west our voyage extended, the better the climate became; even in a distance of 35 miles west, the temperature on Melville island was higher and spring about one month earlier than where our ship wintered. I venture the opinion, arrived at by reading of former expeditions and comparing our own experience, that navigation in Lancaster sound, one hundred years from now, will be as easy as it is in Hudson strait.

Approximate Length and Width of the Main Islands, in the Territory
Annexed to Canada during the Expedition of the
'Arctic,' in 1906-7 and 1908-9.

The territory granted by Great Britain to Canada extends from the sixtieth meridian to the one hundred and forty-first meridian, west longitude.

Baffin island and Bylot island together extend from Hudson strait on the south to Lancaster sound on the north, a distance of about 900 miles. The width of these islands varies from 150 to 500 miles east and west.

North Devon island lies north of Bylot island on the north side of Lancaster sound and has a length, east and west of 300 miles and a width north and south of 75 miles. Jones sound intervenes between North Devon and Ellesmere island. Ellesmere island from Jones sound northward to the Polar sea has a length of 475 miles.

West of Ellesmere island to McClure strait and north of Lancaster sound and Barrow strait are Cornwallis island, Rignes island, North Cornwallis island, Kent island, Graham island, Findlay island, Bathurst island, Byam Martin island, Melville island and Prince Patrick island. The length and breadth of each island mentioned in this paragraph have not been ascertained accurately enough to record. Distances between certain points have been traced along the coast line, but these being fragmentary do not supply sufficient data to give even an approximate idea of the dimensions of each island. Melville island is an exception; it has a length of 200 miles.

South of McClure strait on the west side of the Archipelago are Banks island, 260 miles in length with an average width of 100 miles, and Victoria island, 400 miles in length with an average width of 190 miles.

South of Barrow strait lie Prince of Wales island, North Somerset island, Russell island and Boothia peninsula and King William island.

South of Lancaster sound, Brodeur peninsula adjoins Baffin island which lies to the eastward of the peninsula.

There are numerous small islands on the coasts of the large islands, all of which were annexed at the same time as the large divisions.

North Devon island, Somerset island and part of Ellesmere island were annexed by Commander Low during the cruise of the *Neptune*.

The groups of islands are distinguished by calling the land north of Lancaster sound, Barrow strait and McClure strait the Arctic Archipelago, and the land south of those straits the northern part of the continent of America.

Principal Waters.

Hudson bay, not including James bay, has a length of 500 miles and a width of 500 miles. Hudson strait, from Button islands to the west coast of Mansfield island, is 480 miles long. Roughly speaking, from the Atlantic ocean, through the strait, and across the bay to Churchill, the distance is 1,000 miles. The width of the strait is from 30 to 40 miles at the entrance between Button islands and Resolution island; farther west the width is 84 miles, and at the western end of the strait, 70 miles.

Frobisher bay, on the east side of Baffin island, is 150 miles deep with an average width of 30 miles.

Cumberland sound or gulf, east side of Baffin island, is 170 miles deep by an average width of 40 miles.

Lancaster sound is about 1,000 miles long from east to west with an average width of 40 miles, and is the only Northwest passage for deep-draught vessels.

Jones sound north of North Devon island, is about 300 miles long by 30 miles wide.

Conclusion.

In conclusion, I may say that a faithful record of the movements of the *Arctic*, her latitude and longitude while battling with ice and weather are contained in this report. I am aware of the fact that much of the information will not be of special interest to the general reader, but to mariners who understand the difficulties of navigating waters that present dangers which as yet contain no aids to navigation, the recital of our voyage will doubtless be of use. The account of our observations and the variations from the true north recorded furnishes facts which I believe cannot fail to be of value to mariners of the future. Discoveries of islands and dangers not marked on published charts, are brought to the notice of navigators. Ice movements and their general trend, form part of the knowledge acquired, and the directions which experience has taught me, might be followed with advantage by those who make voyages in our northern waters. I am greatly indebted to those ex-

plorers who preceded me, and who have recorded their observations, for information that enabled our vessel to escape dangers. My three voyages have been uneventful in regard to accidents, the *Arctic* having come through without any mishap.

In the appendices will be found detailed information of ice formation and tidal observations at Winter harbour. To the geologist, the report of Mr. McMillan, and to the meteorologist, the report of Mr. Jackson, comprising part of this volume, will be interesting. The work of annexing the vast territory and territorial waters to Canada, the grant of the Imperial Government, should appeal to the Canadian patriot. The trader and those engaged in fishery enterprises, have placed before them some knowledge of the resorts of food fishes, with a view of encouraging future enterprises in waters as yet untouched.

Facsimilies of documents deposited by Parry, McClure, McClintock, Kellett and Sverdrup, will be curiosities, and verify the records left by these navigators.

The list of bird skins prepared by Mr. Hennessey, will be found in his report. I have included a list of curiosities picked up by myself and various members of the crew. These curiosities and specimens were handed in to the Museum authorities at Ottawa.

The scientific staff, officers and crew performed their duty faithfully and in some cases heroically; much is due to Dr. Bolduc, for his continual inspection and interest taken in the health of all on board. The heroic conduct of the second, and third officers and the men under them, who visited Banks island and Victoria island with sledges, for the purpose of raising our flag, entitled them to special reference. The conditions which they met were unexpected, but they overcame obstacles by persistent and dogged determination. The reports of these officers and the chief engineer, to me, will form most interesting reading to those who appreciate adventure.

CHAPTER XV.

**Historical Summary of Canadian Expeditions to Hudson Strait,
Hudson Bay and Northern Waters.**

I have included historical summaries in this report of the early voyages of discovery in the Arctic archipelago and of expeditions sent out to Lancaster sound, McClure strait, Banks island and Beaufort sea in search of Sir John Franklin. Interesting summaries of these expeditions sent from Britain and the United States have also appeared in Commander Wakeham's report and the report of Mr Low. It will be seen that I have endeavoured to weave into my own narrative at appropriate places, references to the brave navigators who discovered the waters and islands of the Northern Archipelago, and to some of those who sailed south and west of Lancaster sound, Barrow strait, McClure strait and in Beaufort sea. No summary of Canadian expeditions is included in any reports of the expeditions equipped and sent out by Canada. I have considered the voyages made by Canadian vessels of sufficient interest to the public, to give an outline of the several Canadian expeditions.

Expedition under Commander A. R. Gordon, in 1884.

The expedition of Commander Gordon left Halifax on July 22, 1884, in the *Neptune*, a chartered steamer, accompanied by a number of observers and Robert Bell, M.D., G.G.R.S., Geologist and Medical Officer. The *Neptune* arrived off the entrance of Hudson strait on August 3. The different observing officers were left at their respective stations, namely, Port Burwell, Skynner's cove, Ashe inlet, Stupart's bay, Laperriere and Port de Boucherville. From the last named station the *Neptune* first went to Chesterfield inlet and from there south to Marble island, from there to Churchill, from Churchill to York Factory, lying between the mouths of the Nelson and Hayes rivers. She returned to Digges island, opposite Cape Wollstenholme, from that point returning pretty

much by the same route as she went out, with the exception of keeping farther out to sea, and landing at St. Johns, Newfoundland, where the *Neptune* was owned. On this voyage, observations of the currents of Hudson strait were made, the rise and fall of the tide, and the velocity of the tides at the different stations mentioned above, and also at Port Churchill. The temperature of the sea in Hudson strait and Hudson bay was taken, and some description given in Gordon's narrative of the resources of Hudson bay and strait. His narrative also contained a brief description of the inhabitants, the Esquimaux, and of the fauna. Dr. Robert Bell, the Geologist and Naturalist, furnished a lengthy report upon the examination of the geological features of the shores of the strait and the bay, visited by the *Neptune*, and some general remarks on glaciation.

The *Neptune* was a chartered vessel, and was delivered to the owners at St. Johns, Newfoundland, October 18, 1884.

Expedition under Commander A. R. Gordon, in 1885.

The second expedition of Lieut. A. R. Gordon was made in 1885, in the *Alert*, the vessel used by Sir George Nares in 1876, in his Arctic expedition under the British Admiralty. Lieut. Gordon left Halifax on May 27, 1885, and proceeded to the entrance of Hudson strait, but did not get any farther than Resolution island, where damage was done to the stem of his vessel. He steered for St. Johns, Newfoundland, to have repairs made, again returning to the entrance of Hudson strait. He called at the different stations established in 1884, and took on board the men with their instruments for observation, and again crossed the bay to Churchill, where he took up the soundings of the previous year for the purpose of making a plan of Churchill harbour. The object of the trip was exactly the same as that of the voyage of 1884, but the report on the voyage contains information obtained by the observers that remained the year in the strait, and their notes relating to the movements of the ice, and general observations.

Dr. Bell accompanied Lieut. Gordon on this trip, pursuing his search for economic minerals or evidences of them, and the study of the general geological formation of the country. Mag-

netic observations were also made by Mr. Stupart, and absolute determinations were made at the Toronto Observatory.

Expedition under Commander A. R. Gordon, in 1886.

Commander Gordon, in his voyage of 1886, followed the instructions to proceed to the mouth of Hudson strait for the purpose of making the passage through the strait. He left Halifax on June 24, and arrived off Hudson strait on July 3, pushed through the strait, calling at some of the stations established in 1884. He crossed the bay from Cape Southampton to Churchill and arrived in the harbour on July 29. Some time was employed in making a survey of Churchill harbour. The plan prepared by Gordon shows the soundings noted in fathoms at low water. Outside the entrance of the harbour, the depth was from 9 to 13 fathoms, decreasing until opposite the Hudson Bay warehouse it was 5 fathoms. He visited the mouth of the Nelson river, and made soundings of Nelson harbour, which are given in feet at low water. It was unsafe to take the ship nearer than about 13 miles from the mouth of the river. The soundings were accordingly made, in Nelson harbour, in a boat. There is a channel from the Nelson river into the bay, but it is narrow and tortuous. The most direct line of soundings gives the depth from 6 feet near the shore to 33 feet at the ship. Between the ship's position and the least depth, the water measures 12 to 14 feet; 14 feet only having been found a short distance from the ship. The voyage appears to have been made with comparative ease from Halifax to Churchill, Nelson and return. In 1886, Commander Gordon found the strait navigable about a month earlier than in 1885, and, in his conclusion respecting the season of navigation, takes into consideration the main question of the object of the expedition, namely, that practical commercial navigation in the straits can be kept up during July, August, September and October.

His reports were published separately, and also in the annual reports of the Department of Marine and Fisheries for the years 1884-5-6. He made some soundings in Churchill harbour and prepared a map or plan of the harbour, showing

the depth of water and the accommodation the harbour can afford vessels. He came to the conclusion that Churchill harbour is a very much better place for vessels to load than the mouth of Nelson river can possibly be made.

Churchill is a natural harbour, where the tide rises 15 feet 5 inches at spring tide and 8 feet at neap tide. It is impossible to get within 12 miles of the mouth of Nelson river with vessels drawing any depth of water. It was also ascertained that silt and mud, brought down the river by freshets in the spring of the year, would fill up any artificial harbour that might be made at Nelson.

Expedition of Commander William Wakeham, in 1897.

The fourth expedition to Hudson bay was made in 1897, under Commander Wakeham, of the Marine and Fisheries Department, in the steamship *Diana*. The expedition was for exactly the same purpose as the three voyages under Commander Gordon, namely, to ascertain more fully, if possible, the length of time which vessels engaged in commercial trade, might navigate Hudson strait and Bay. One special feature of the instructions given to Commander Wakeham, was the direction to pass in and out of the Strait as often as he could from the time of his first entrance. The *Diana* left Halifax on June 3, 1897, passing around the coast of Nova Scotia and through the Gulf of St. Lawrence and Strait of Belle Isle, and coasting along Labrador. She met very heavy ice coming down from Baffin bay, which impeded her progress to a great extent, but she arrived off the entrance of Hudson strait on June 22. She was headed for the Strait and passed along the north side, but was compelled to change her course and was carried two-thirds of the width of the Strait south, towards the northwest side of Ungava bay; she was forced north again under great difficulties, arriving opposite Ashe inlet about July 2, and crossed the Strait to Douglas harbour on the south side of the Strait. The trip was continued, the vessel approaching near Salisbury island and then across to Digges island, and from there to the north end of Mansfield island, and returned to the eastern entrance of Hudson strait, north of Button islands.

The course steered the second trip was practically from the east to the west end of the Strait as far as Digges island, through the centre of the Strait, returning in a northerly direction to some islands lying south of Salisbury island and then to the vicinity of Emma island, passing close to Big island, in the vicinity of Ashe inlet, to the mouth of Ungava bay and then north around the Button islands to Cape Chidley, and from there to Nachvak bay, arriving on July 31.

The third trip was made from Nachvak bay north to Kerkerton islands in Cumberland gulf, and then south to the entrance of Hudson strait and to the bottom of Ungava bay; proceeding from that point on August 16, Commander Wakeham navigating the Strait, going westward and crossing Hudson bay to Fort Churchill, arriving there on August 28, returning through the centre of the Strait as far as Port Burwell and then north around Cape Chidley returned to St. Johns, Newfoundland.

The *Diana* passed out of Hudson strait on October 30 and arrived at Halifax after a rough passage, on November 11, 1897.

Two geological parties were taken on board the *Diana* and landed on the shores of Hudson strait and bay, but on one of the trips made through the Strait, they were picked up and taken to St. Johns, Newfoundland; the *Diana* returned to the Strait and resumed the trips already described.

Cruise of the 'Neptune,' 1903-4.

The *Neptune* left Halifax on August 24, 1903, under the command of A. P. Low, Geologist. The main purpose of the expedition was to patrol the waters of Hudson bay and of the eastern Arctic islands further north, and for the purpose of establishing permanent stations for the collection of customs and the enforcement of Canadian law.

The *Neptune* passed along the coast of Labrador, entering Nachvak bay, thence to Port Burwell and from there northward to Cumberland gulf, calling at Kerkton, and Blacklead. On the passage south from Cumberland gulf, Cape Haven was made, north of Cyrus Field bay. The course was followed

across the mouth of Frobisher bay and Hudson strait was entered on the north side. The strait was crossed to Douglas harbour and a passage taken for the east end of Charles island. The cruise was continued past Southampton island into Hudson bay and to Fullerton harbour. The *Neptune* was put in winter quarters at Fullerton harbour on September 23.

A plan of Fullerton harbour was made during the winter. On July 18, 1904, the *Neptune* left Fullerton harbour and steamed to the south towards Mansfield island, and entered the Strait, making her passage to Port Burwell, where she was met by the *Erik* with stores. The *Neptune* proceeded northward for Smith sound, taking a course along the coast of Greenland. The voyage was continued north to Cape Sabine, calling at Etah in latitude $78^{\circ} 30'$ north. On the way south, Ross bay was crossed, and a record left at Cape Herschel on the mainland of the great island of Ellesmere. Proceeding south, Lancaster sound was entered, and the *Neptune* passed along the island of North Devon and anchored off Beechey island, where the crews of the *Erebus* and *Terror* of Sir John Franklin's expedition spent a winter. From Erebus harbour, Beechey island, the *Neptune* stood southward across Lancaster sound for North Somerset island, Leopold island and Cape Clarence at the mouth of Prince Regent inlet, and from there the cruise was continued to Ponds inlet. The passage was made south to Cumberland gulf, and from Cumberland gulf the *Neptune* returned to Port Burwell; from Port Burwell the cruise was continued through Hudson strait to Fullerton in Hudson bay.

On the homeward voyage from Fullerton, Port Burwell was made, the vessel arriving there on October 1. The *Neptune* returned to Halifax, arriving on October 12.

In addition to the establishing of Mounted Police stations and Custom House stations; observations and examination of the geological formation of the places visited by Mr. Low, the commander, were made, thus a vast amount of geological knowledge was added to what had been previously acquired.

Expedition to Hudson Bay, 1904.

Major Moodie, of the Royal Northwest Mounted Police, was sent in command of the government force with myself in command of the *Arctic*.

The *Arctic* left Quebec on September 17, 1904, and arrived at Port Burwell, Ungava bay, on October 1. She left Port Burwell and passed through Hudson strait without encountering any ice on the voyage until she got within a few miles of Fullerton harbour; the ice was floating in and out of the harbour with the tide. It was newly made and is called slob ice. The ice in the inner harbour was frozen to a thickness of about 4 inches. Fullerton was made the winter quarters of the vessel.

Major Moodie reported that the winter passed quickly and pleasantly, the lowest temperature being 52 degrees below zero, and this cold was not severely felt.

On July 1, 1905, the *Arctic* commenced breaking her way out of Fullerton harbour, and left the harbour on the 5th. On the 10th, the vessel was 400 miles towards Churchill; the ice was packed tight, and no sign of water was to be seen to the south or west. It is stated in the report that there was no doubt concerning the possibility of making Churchill, but it would be a matter of time; the vessel was headed in a direction towards Hudson strait.

On July 14, 1905, the ship ran clear of all ice and shaped her course for Cape Southampton, Coats island. When she arrived at the island only a few pieces of floating ice were seen. Erik harbour was entered, which was free of ice excepting some pieces aground at the head of the harbour.

About 40 miles east of Erik harbour a harbour was found where a good sized river empties into it. The land rises to a considerable height with good flat benches around the bay. The surrounding hills were covered with grass. It was found, however, that a bar exists which prevents vessels entering at any other time than high water. This harbour was called Préfontaine harbour and the headland on the east side of the entrance named Cape Sir Wilfrid Laurier, and the island on the west side of the entrance, White island, after Colonel White, Com-

troller of the Mounted Police. The harbour was not shown on any chart, although it was the best one that had been entered; it averages about $1\frac{1}{2}$ miles across. The natives say that the harbour was open on June 1, and that no heavy ice ever comes in from the Strait. The *Arctic* passed towards the eastern entrance of Hudson strait, calling at a number of places until she reached Port Burwell, and from Port Burwell went to Chateau bay, where orders were received by me to proceed to Quebec.

The voyage was uneventful, with the exception of breaking one propellor blade that was quickly replaced by a spare one, carried on board.

There was but one report made and that by Major Moodie, who stated in respect of the navigation of Hudson straits that any well built and well engined steamer could enter the strait and bay early in July. It was possible for a steamer to be delayed by ice, if the winds were from the northeast, but she would not be in any danger. However, the winds vary from year to year, and one year is no guide to what the prevailing winds will be in the next.

In connection with the voyage, it is worthy of note that Major Moodie was commissioned by the government to establish Mounted Police stations, and for the *Arctic* under my command to attend to annexing to Canada Arctic territory granted by the Imperial Government. It was intended to send the *Neptune* to Hudson bay with small houses, to enable the men to establish a Mounted Police station at Fullerton harbour, but delay occurred in getting the *Neptune* ready in time to reach Hudson bay, in the spring of 1905, therefore, the trip to the more northern waters was abandoned until the spring of 1908.

' Arctic ' Expedition, 1906-7.

The next expedition was sent out in 1906, under myself as commander, for the purpose of patrolling the waters of the Arctic regions and annexing islands and territory granted by the British Crown to Canada. The jurisdiction of Canada was established over the territories annexed and the territorial waters; licenses for fishing were issued, and whalers and others

were informed that regulations in regard to fishing would be enforced, and Canadian customs duties, upon imported goods to be disposed of in trading with the natives, would be collected.

The *Arctic* left Quebec on July 28, 1906, and passed down to the Gulf of St. Lawrence and out by the Strait of Belle Isle, thence along the coast of Labrador. The course was taken across to the Greenland coast, which is at that time of the year the safest one to take on account of the numerous icebergs which come from the vicinity of Cape York, Greenland, and Baffin bay. The coast of Greenland was followed until the vessel reached $74^{\circ} 42'$ north latitude, and 63° west longitude, then the course was changed towards Lancaster sound. Bylot island on the south side of the sound was passed, and the voyage continued until Navy Board inlet was reached. The inlet was entered and a course made to Albert harbour, where the *Arctic* anchored. Notices were issued to inform the whalers of the regulations requiring them to procure licenses on payment of \$50. These notices were left in charge of an agent of the whaling station, to be delivered to captains of whalers which make the station a calling place. The *Arctic* then returned by the same waters as she had sailed, back to Lancaster sound, and when Navy Board inlet was left, the vessel pursued her way through Barrow strait westward, calling at Port Leopold, where records were left. Cornwallis island, Griffith island, Bathurst island, Byam Martin island and Melville island were taken formal possession of, together with Prince Patrick island and the whole Parry group of islands. Records were left at the different places touched and cairns built as tokens of the annexing all of these islands to Canada. The most westerly point reached, on this voyage, was Arctic point, Melville island, where documents claiming for the Dominion of Canada, in pursuance of the grant of these islands by the Imperial Government, all islands and lands adjacent to the territory visited.

From Melville island, the steamer proceeded eastward to Lowther island, and entered Peel sound going as far south as Cape Whitehead on North Somerset island. The course was then changed to go north to Limestone island and from there to Resolute bay, on the south coast of Cornwallis island, and from Resolute bay eastward to Erebus bay, where the memorial

tablet erected to Sir John Franklin was re-erected. Admiralty inlet was entered, several points and bays named, and then the vessel returned to Navy Board inlet and coasted south and east until Albert harbour in Ponds inlet was reached, where the *Arctic* wintered. The *Arctic* then, in 1907, proceeded east and north to Cone island, Jones sound, on the east coast of North Lincoln, where a flag was raised and records left; from there her course was directed east, across Baffin bay to the coast of Greenland until about opposite Cumberland gulf; crossing westward to Cumberland gulf, which was entered, and Kekerton made.

The course was then made to Blacklead, and from there to Port Burwell, where some soundings were taken and some beacons placed. From Port Burwell the *Arctic* returned to Quebec, where she arrived on October 19, 1907.

The voyage was notable for the number of places visited in Lancaster sound, Barrow strait, Peel sound, Prince Regent inlet, Admiralty inlet, Navy Board inlet, Ponds inlet and the visit to Cone island, Jones sound, latitude $76^{\circ} 20'$ north, longitude $81^{\circ} 30'$ west. Harbours, bays and straits, visited by Sir Edward Parry and by the expeditions sent to search for Sir John Franklin, were also visited by the *Arctic*. In addition, many records were left in different localities, to apprise all interested of the fact, that all lands and islands in the Arctic and northern regions, granted by the Imperial Government, were taken possession of and now form part of Canada.

The report of this voyage was published in 1909, by the King's Printer, for the Department of Marine and Fisheries.

The ship's company on the voyage, including officers and crew, consisted of 41 persons.

The report of the voyage of 1906-7, shows that the voyage was difficult owing to head winds, foggy weather and to meeting heavy ice. Notwithstanding these difficulties the health of all on board was excellent, with the exception of F. Brokenhauser, an oiler, who died of heart disease and was buried at Albert harbour in a cemetery specially laid out. No accidents to the ship occurred, nor did any incident of an unpleasant nature take place on board that is deserving of special mention.



TRACK CHART

to accompany Journal of H.M. SLEDGE "SUCCESS"
 Auxiliary to the S.W. Division from
 15th to 28th April 1851.

The Land is placed according to the *Adm.*
 having ~~sufficient~~ data to correct it by
 assumed from the same source, and the ~~land~~
 by eye.

Fred^c J. Kras & 2nd 3



Observations taken Saturday 19th April 1851

Angles taken by Kator's 6 Inch Compass	C. Walker highest part 6.30 Lowther I st S.W. 76.0 N. 119.0 C. Bunny (supposed) 290.0
Mer ⁿ Alt ^{de} 52.58.10 + 4.20	For Time
Dent (84.50) For Variation	Means of 3 Each
9.30.50 24.30	9.28.25 42.29.17
31.0 23.30	- 4.20
31.20 23.30	
19 71.30	
9.31.63 N 23.50 E	9.32.17 42.3.10

No others were obtained from general thickness of the weather

FACSIMILE

Battery beacon

Battery

Fort Prince of Wales

Eskimo Beacon

View of Churchill Harbour from the mast head
Battery beacon $S\frac{1}{4}E2\frac{1}{4}'$

Eskimo Point

Beacon

Fort Prince of Wales

PLAN of CHURCHILL HARBOUR

By LIEUT A.R.GORDON, R.N.

Ass^d by J.W.Tyrrell P.L.S.

Lat. of Obs ⁿ Spot.	Spring rise 15 5 ft.
Long. " " "	Neap rise 8 0 ft.
Mag. Var ⁿ 10° E	Corrected Estab. VI th 47 ^m

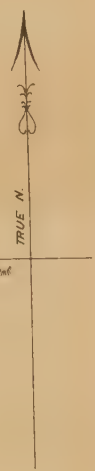
Scale:—1 in = 2000 ft.

Ship's Point

Battery

Battery Beacon
Obs. Spot

H.B. Warehouses



Sloop's Cove
Winter quarters of Furness

Cockle's Point

Note: Soundings are noted in fathoms L.W.



APPENDICES

APPENDIX I.

Tidal Observations at Winter Harbour, taken by Captain Bernier, C.G.S. 'Arctic,' 1908-9, assisted by W. E. W. Jackson, M.A., J. G. McMillan, B.A.Sc., and Geo. Braithwaite, First Mate.

CAPTAIN BERNIER,

Marine Department, Ottawa, Ont.

DEAR CAPTAIN BERNIER,—The tidal observations obtained by your expedition to the Arctic ocean, at Melville island, are especially interesting in being from an entirely new region. Your officers deserve much credit for their perseverance in obtaining such full detail, by continuous observation day and night. The concise reduction which I have prepared for your report, will serve to show the character of this tide, for the information of future navigators in those parts.

It appears that you have succeeded in obtaining the true tide of the Arctic ocean itself. For, your point of observation was within 200 miles of the open ocean to the north; and the small range of the tide, which is less than 5 feet, indicates its oceanic character. When the observations are plotted as tide curves, their symmetrical form, and the character of the secondary undulations which they show, favour the same conclusion. Also, the diurnal inequality, although well marked, is not excessive; amounting to about 25 per cent of the range. These features accord better with an oceanic origin, than with a tide which could only reach Melville island by travelling many hundred miles through a series of straits and sounds from the region of Baffin bay and Davis strait.

The tidal observations obtained at Spitzbergen by the Swedish Government, from March to July in 1900, show a range of tide which is much the same as at Melville island. It will be very interesting also to compare the tidal observations at the northern end of Greenland, obtained by the Peary expedition, when these become available. With observations at three points, so far separated, around the shores of this ocean, it should be possible to form a satisfactory estimate of the general character of its tides.

Yours very truly,

W. BELL DAWSON,
Superintendent of Tidal Surveys.

TIDAL OBSERVATIONS at Winter Harbour, Melville island, Arctic ocean, taken by Capt. Bernier, C. G. S. *Arctic*, assisted by W. E. W. Jackson, M.A., J. G. McMillan, B.A.Sc., and Geo. Braithwaite, first mate.

SPRING TIDES.				NEAP TIDES.				
—	Date.	Ranges.	Mean.	—	Date.	Ranges.	Mean.	
1908.....	Nov. 25.	3·57	3·37	1908.	Dec. 1..	1·17	1·69	
		3·73				1·36		
		3·25				2·19		
		2·93				2·05		
	Dec. 8..	2·95	3·24		Dec. 17.	0·93	1·19	
		3·24				0·78		
		3·58				1·41		
		3·21				1·63		
	Dec. 25.	2·80	3·23		1909.....	Jan. 1..	2·12	1·76
		3·15					1·67	
		3·70					1·36	
		3·29					1·89	
1909....	Jan. 8..	2·58	3·12	Jan. 16.	1·27	1·29		
		2·73			0·88			
		3·65			1·40			
		3·50			1·61			
	Jan. 23.	3·40	3·73	Jan. 31.	1·67	1·55		
		4·42			1·91			
		3·62			1·30			
		3·47			1·33			
	Feb. 6..	3·09	3·28	Feb. 15.	0·64	0·97		
		3·78			0·79			
		3·20			1·03			
		3·05			1·41			
	Feb. 23.	3·63	4·15	Mar. 1..	0·96	1·08		
		3·94			0·89			
		4·58			1·29			
		4·46			1·19			
	Mar. 9..	3·46	3·58	Mar. 2..	0·93	0·94		
		3·78			0·81			
		3·77			0·84			
		3·32			1·20			
	Mar. 23.	4·76	4·54	Mar. 16.	0·93			
		4·19			0·81			
	Mar. 24.	4·35			0·84			
		4·90			1·20			

The figures in the columns headed 'Ranges' show the rise and fall of the tide on the days of greatest and least range in the month. The resulting means are thus the best values for the spring range and the neap range.

It will be noticed that there are times, when the moon's declination is high, that there is a marked diurnal inequality. This inequality is eliminated by the above method.

Reduction of the observations by the Tidal Survey, Department of Marine, Ottawa.

W. BELL DAWSON,
Superintendent.

January 17, 1910.

APPENDIX II.

Fullerton, Ice Formation, 1904-5.

On arrival, October 16th, ice was	4 inches.
November 20, ice was	22 "
December 3, 1904	24 "
" 10	28 "
" 17	31 "
" 24	32 "
" 31	34 "
January 7, 1905	36 "
" 14	37 "
" 21	38 "
" 28	40 "
February 4	42 "
" 11	45 "
" 18	48 "
" 25	51 "
March 4	54 "
" 11	57 "
" 18	59 "
" 25	62 "
April 1	65 "
" 8	67 "
" 15	67 "
" 22	66 $\frac{1}{2}$ "
" 29	66 "
May 6	66 "
" 6, another piece of old ice	72 "
" 13	65 "
" 20	61 $\frac{1}{2}$ "
" 27	62 $\frac{1}{2}$ "
June 5	61 "
" 10	60 "
" 17	56 "
" 24	49 "
July 1, ice was	38 "
" 4	36 "

Ship had to be sawed out, and with the help of steam we broke through the ice by butting at it. We sailed from Fullerton on July 5, 1905, for Churchill, and we met the packed ice, and sailed through about 150 miles of ice of that year's formation. We could have reached Churchill by keeping along the land, which was reported clear of ice, with west wind.

J. E. BERNIER,
Arctic.

APPENDIX III.

Statement of the Ice Formation during the Winter, and other conditions of the Ice in Albert Harbour (Ponds Inlet), 1906-7.

Arctic arrived in the harbour on September 9, 1906. Ice commenced to drift in the harbour from the sea on October 9.

DATE.		THICKNESS.
1906	October 16	Heavy ice came in.... 18 feet.
"	" 17	Ice stopped in the harbour 7 "
"	" 20	Ice formation... 2 inches.
"	" 27	 7 "
"	November 3	 10 "
"	" 10	 12 "
"	" 17	 15 "
"	" 24	 19 "
"	December 1	 20 "
"	" 8	 20 "
"	" 15	 20 "
"	" 30	 21 "
1907	January 5	 20½ "
"	" 12	 24 "
"	" 19	 29 "
"	" 26	 30 "
"	February 2	 33½ "
"	" 9	 39 "
"	" 16	 41 "
"	" 23	 42 "
"	March 2	 43 "
"	" 9	 44 "
"	" 9	(1,000 feet outside the harbour)... 58 "
"	" 16	 48 "
"	" 23	 52 "
"	" 30	 60 "
"	April 6	 61 "
"	" 6	(Outside of the harbour)... 65 "
"	" 13	 61 "
"	" 20	 61 "
"	" 27	 61 "
"	May 4	Ice formation... 61 "
"	" 12	(Snow commenced to melt)... 61 "
"	" 18	(Snow embankments are getting rotten and are melting away fast)... 60 "
"	" 25	 60 "
"	June 1	 59 "
"	" 8	 59 "
"	" 15	 59 "
"	" 22	 58 "
"	" 29	(Ship ranging on her berth)... 56 "
"	July 6	 56 "
"	" 13	(Ice is bad) 50 "
"	" 20	Ice broke in the harbour and is moving with the tide.
"	" 27	C. G. S. <i>Arctic</i> , left harbour for sea.

J. E. BERNIER,

Commanding Officer, C. G. S. Arctic.

On board the C. G. S. *Arctic*,

July 27, 1907.

APPENDIX IV.

Statement of the Ice Formation during the Winter, and other conditions of the Ice and Harbour.

WINTER HARBOUR, MELVILLE ISLAND, 1908-9.

The *Arctic* arrived in the harbour on August 28, 1908. Ice commenced to drift into the harbour from the sea on September 1, grounding on the reef and remaining there.

1908.

August	26.	Several pieces of ice in the harbour aground.	
"	29.	No ice in the harbour.	
September	—.	Ice commenced to form in the harbour.	
"	5.	Slob commenced to form along shore.	
"	10.	Ice commenced to form in the harbour.	
"	12.	Harbour covered with slob ice.	
"	19.	Harbour covered with ice 4 inches thick and very uneven, 4 to 5 inches.	
"	26.		9 inches.
October	3.		12 "
"	10.		15 "
"	17.		18 "
"	24.		21 "
"	31.		29 "
November	7.		24 "
"	14.		28 "
"	21.		31 "
"	28.		33 "
December	5.		34 "
"	12.		43 "
"	19.		44 "
"	26.		45 "
January	2.		51 "
"	9.		51½ "
"	16.		61 "
"	23.		63 "
"	30.		69 "
February	6.		69½ "
"	13.		72 "
"	20.		77 "
"	27.		79 "
March	6.		80½ "
"	13.		81 "
"	20.		82 "
"	27.		83 "
April	3.		84 "
"	10.		85 "
"	17.		85 "
"	24.		85 "
May	1.		86 "
"	8.		84 "
"	15.		80 "
"	22.		86 "
June	3.		96 "

(Being an average of 8 measurements.)

1908		
June	5	91 inches.
"	12	89 "
"	19	87 "
"	26	84 "
July	3	66 "
	(Ice honeycombed.)	
"	6	60 "
"	10	65 "
	Shoal water 45 inches deeper.	
	" " "	
"	17	50 "
"	24	40 "
"	31	30 "

31st July, first move in the harbour ; 3rd August, left the harbour with the ice ;
4th August, all ice gone from the harbour.

APPENDIX V.

Movements of Ice off Winter Harbour, Melville Island, 1908.

Date.	Remarks.
Aug. 27..	20 miles of water abreast off Cape Providence, visible from crow's nest.
" 28..	Arrived at Winter Hr. No ice visible outside South of Harbour.
" 29..	
" 30..	No ice visible from crows nest.
" 31..	Large pieces of ice coming from east and grounding on harbour shoal; no ice visible in Strait.
Sept. 1..	
" 2..	
" 3..	No ice visible in strait from crows nest.
" 4..	"
" 5..	"
" 6..	Slob making along shore; no ice visible in Strait.
" 7..	"
" 8..	"
" 9..	Several pieces of ice grounding on Hearne point; no ice visible in Strait.
" 10..	No ice visible in the strait from crows nest.
" 11..	"
" 12..	"
" 13..	Heavy slob and several icebergs in the Strait.
" 14..	"
" 15..	Ice conditions the same from crows nest.
" 16..	"
" 17..	Slob making about 5 miles off the land; no ice visible in the Strait.
" 18..	Heavy glint of ice to the S. E.
" 19..	Fog.
" 20..	Sleet.
" 21..	No slob visible in the Strait from crows nest.
" 22..	No ice visible in the Strait.
" 23..	"
" 24..	"
" 25..	"
" 26..	Sheet ice in the Strait, lakes of water visible.
" 27..	"
" 28..	Fog.
" 29..	"
" 30..	Water visible in the Strait; 6 p.m. clear water in the Strait.
Oct. 1..	Clear water up and down the Strait, seen from crows nest.
" 2..	"
" 3..	Fog.
" 4..	Snow drift.
" 5..	"
" 6..	
" 7..	No water to be seen in the Strait.
" 8..	Sheet ice moving to the S. E.; wind flow edge 5 miles out from ship
" 9..	Snow drift.
" 10..	No ice to be seen in Strait; flow edge 3 miles off.
" 11..	"
" 12..	Flow edge about 7 miles off; water visible outside from crows nest.
" 13..	Water visible in Strait from crows nest.
" 14..	
" 15..	Strait covered with ice, visible from crows nest.
" 16..	Snow.
" 17..	"
" 18..	

Date.	Remarks.
Oct. 19..	Ice the same ; no water visible from crows nest.
" 20..	" "
" 21..	" "
" 22..	Hazy.
" 23..	Planted 3 flags S.E. from ship about 8 miles ; ice very hummocky.
" 24..	
" 25..	
" 26..	
" 27..	
" 28..	
" 29..	Brought the flags in front to the S.E.; ice in same condition in the Strait
" 30..	as it was on the 23rd of October
" 31..	Hearne Point and harbour shoal with small bergs grounded on them. Ice
	in the Strait rafted ; very rough for travelling.
Nov. 1..	Ice in harbour and Strait
" 2..	
" 3..	{ During November we have had a good deal of moisture in the air, seeming to indicate lots of open water to the North of us and weather mild for the season of the year.
" 4..	
" 5..	
" 6..	

J. E. BERNIER.

APPENDIX VI.

GEOLOGICAL SURVEY,
R. W. BROCK, DIRECTOR.

DEPARTMENT OF MINES, CANADA,
OTTAWA, November 17, 1909.

Received from Captain J. E. Bernier, specimens for the section of Arctic Exploration as per attached list. These specimens have been collected by Captain Bernier during the cruise of the ss. *Arctic* in 1908-9, and are now with the museum stores of this Department.

ROBT. A. A. JOHNSTON,
Curator of the Museum.

ARCTIC EXPLORATION.

**List of Materials Contributed by Captain J. E. Bernier from the
Expedition 1908-9.**

November 8, 1909.

1. Board with instructions indicating the position of Captain Kellett's Depot, Dealy island, Melville island.
2. Record box found in Captain Henry Kellett's Depot, Dealy island, Melville island.
3. Pole found on Melville island—Sir William E. Parry, 1819-20.
4. Hand bars, Melville island—Sir William E. Parry, 1819-20.
5. Maul (ship's)—*Resolute*, 1851-3, Melville island.
6. Adze—H.M.S. *Resolute*, Captain Henry Kellett, 1851-3.
7. Eskimo toy, Pond inlet.
8. Rope found Bay of Mercy—*Investigator* expedition, 1850-2.
9. Prayer book, Melville island—Sir William E. Parry, 1819-20.
10. Tent peg, Melville island—Sir William E. Parry, 1819-20.
11. Lead bullet, Cockburn point. Date, 1851.
12. Two Eskimo pipes.
13. Polar bear teeth.
14. Fox skulls.
15. Two pieces of rope from Sir John Franklin's Monument.
16. Pieces of wood from yacht *Mary*, Captain John Ross, 1854.

17. Record box left by Commander A. P. Low.
18. Driftwood, Liddon gulf, found by Reuben Pike, ss. *Arctic*, 1909.
19. Box of teeth, shells, buckles, buttons, &c., Melville island.
20. Piece of porcelain found on Beachy island, September, 1906.
Relics of the North Star expedition of 1854.
21. Wash-mop—Parry expedition, 1819-20.
22. Record in bottle—whaler *Esquimo*, Captain Philips, 1819.
23. Wood from Parry's expedition, 1819-20.
24. Wood and rope, Cape Haven, Baffinland.
25. Wood, coal and ivory, Liddon gulf, 1906.
26. Piece of bunk of a boat at Erebus bay, September 2, 1908.
27. Coiled brass shell, from old type of rifle found at Beachy island, 1906.
28. Piece of pick, found on Cockburn island, 1906.
29. Piece of bone with names of travellers.
30. Bullets of various calibres cut from musk oxen.
31. Two pieces of broken earthenware, from Parry's expedition, 1819-20.
32. Glass nails, &c., from Parry's expedition of 1819-20.
33. Perforated sheet of copper, from one of the sloops left for Franklin, Beachy island.
34. Portion of copper vessel left by Sir William Edward Parry, found on Melville island.
35. Piece of sheet copper, found on Melville island, just north of Winter harbour. Relic left by Sir William E. Parry.
36. Lamp bottom, left by Sir William E. Parry on Melville island.
37. Tent pegs, left by Captain Sabine on Melville island.
38. Box handle, Melville island, left by Sir William E. Parry.
39. Rowlock socket, taken from one of the sloops left by Franklin, Beachy island.
40. Two guns, from Depot House of Kellett and McClintock, Dealy island, Melville island.
41. Parts of a thermometer, from the *Resolute* of 1851-3.
42. Piece of a board from the yacht *Mary*, Sir John Ross, 1850-1.
43. Some pieces of board taken from an old boat, part of Sir Edward Belcher's North Star expedition.
44. McClintock's record box, June 11, 1851.
45. Sweater found in a cask at Depot House, Dealy island, Melville island, August 31, 1908, J. G. McMillan, ss. *Arctic*.

46. Relics from fireplace of Parry's expedition, Melville island, 1819-20.
47. Books, &c., 19 in number, from the Depot House of H.M.S. *Resolute*, Captain Henry Kellett, 1851-3, Melville island, latitude 75 degrees north and longitude 109 degrees west.
48. Barrel of flour, from the Depot House of H.M.S. *Resolute*, Captain Henry Kellett, 1851-3.
49. Box of ammunition, from the Depot House of H.M.S. *Resolute*, Captain Henry Kellett, 1851-3.
50. Musk ox head.
51. Skin of Northern gyrfalcon.
52. Skin of snowy owl.
53. Skin of loon.
54. Skin of barren ground caribou.
55. Skin of wolf.

Also a collection of minerals, rocks, coal, &c., from points in the Arctic regions visited by Captain Bernier during the cruise of the C.G.S. *Arctic* in 1908-9.

APPENDIX VII.

Deputy Minister of Marine and Fisheries.

OTTAWA, February 25, 1910.

DEAR SIR,—I beg to inclose herewith report of chemist of the Mines Branch on specimen sent for analysis.

Yours very truly,

EUGENE HAANEL,
Director of Mines.

No. 1603.

LABORATORY OF MINES BRANCH,
DEPARTMENT OF MINES,
OTTAWA, February 23, 1910.

Character—Bituminous coal.

Locality—Shore of Reef point, Winter harbour, Melville island.

Received from—Captain Bernier.

Address—Department of Marine and Fisheries.

Moisture.	1.52
Volatile carbon.	44.88
Fixed carbon.	24.43
Ash.	29.17

H. A. LEVERIN,
Chemist.

APPENDIX VIII.

Records left at different places touched by the Commander and Officers
of C.G.S. 'Arctic' during the last two voyages in
the Arctic Archipelago, 1906-7-8-9.

Albert harbour, West entrance, Baffin land.
Beloeil island.
Canada point, Bylot island.
Port Leopold, Whaler point, North Somerset.
Beechy island, head of Memorial slab of Sir John Franklin.
Dobell point, Griffith island.
Sheringham point, Cornwallis island.
Gourdeau point, Lowther island.
Cape Hotspur, Bathurst island.
Cape Cockburn.
One-quarter mile west of Cape Gillman, Byam Martin island.
Arctic point on Melville island, east.
Dealy island.
Desbarats islands.
Cape Bounty, Melville island.
Cape Halse, Melville island.
Point Wakeham, Melville island.
Fife Point, Melville island.
Parry rock, Winter harbour.
Table hill.
Hearne point.
Northeast hill.
Cape Russell, Banks island, Peel point records left with Cape
Russel records.
Bay of Mercy, Banks island.
Cape Walker, on Russel island.
Edwards point, west side of Cobourg island.
King Edward VII point, on North Lincoln, Ellesmere land.
Cone island, off Ellesmere land.
Ashe inlet, Hudson strait.

Daily Ration for Each Man while Travelling.

Pemmican...	1 lb.
Biscuit..	$\frac{3}{4}$ lb.
Chocolate..	$1\frac{1}{2}$ oz.
Sugar...	$\frac{1}{4}$ oz.
Tea...	$\frac{1}{4}$ oz.
Sugar for cooking..	$\frac{1}{2}$ oz.
Potatoes...	2 oz.
Tobacco..	$\frac{1}{2}$ oz.
Curry and onion powder.	
Pepper and salt for soup.	

This is ample daily ration for men working in the Arctic ocean.

APPENDIX IX.

Report of Seal and Whale Fishing for 1908.

A return, prepared by Mr. James Mitchell, owner of whaling vessels in Dundee, and published in the Dundee Year Book, shows the results of the whale fishing for the past year. While the ships that pursued whaling at East Greenland (the *Scotia* and *Balæna*) secured catches yielding handsome dividends, the Davis straits' fishing was very unproductive, resulting in heavy loss to shareholders. Whalebone has been sold at \$2,000 per ton. The following are the returns:—

Ships.	Masters.	Voyages.	Whal.s.		Walrus.	Seals.	Bears.	Tons, oil.	Cwts. bone.
			Black	White.					
Balæna	Murray....	Greenland..	4	.....	.....	13	9	39	33
Scotia....	Robertson..	"	6	.....	.....	131	13	53	55
St. Hilda...	Cooney....	Davis str...	.....	.....	238	.....	.....	20½	.....
Queen Bess.	Stephen....	"	.....	7	82	1,938	6	14½	.....
not whaling.									
Active.....	Murray....	Hudson bay	1	5	452	260	100	43	10
Eclipse....	Milne....	Davis str...	.....	93	47	21	16	16	.....
Morning....	Adams	"	2	218	68	45	37	71	34
Diana.....	Mackay ...	"	1	217	3	5	24	33	4½
Ponds bay,									
Station per									
Eclipse....	.....	"	1	.....	9	671	36	17½	12
8 vessels.....			15	540	899	3,084	241	307½	153½
9 " 1907			3	36	634	1,021	258	97	32½
9 " 1906.....			7	8	534	1,264	189	111	73
10 " 1905.....			23	37	122	408	200	290½	339

In addition to the above, the *Active* brought one hundred and forty-five foxes, and from the Ponds bay station there came twenty foxes—a total of one hundred and sixty-five. In 1907, seven hundred and forty foxes were secured; in 1906, eight hundred and seventeen; and in 1905, four hundred and seventy-one.

J. E. BERNIER.

Report of Seal and Whale Fishing for 1909.

(From the Dundee Year Book.)

In some respects 1909 has been a disastrous year for the whalers. Two of the vessels which ventured out into the waters of the Arctic never returned, and their crews suffered untold privations before they were rescued and brought back to safety. These were the *Snowdrop* and the *Parados*, and, in addition to the loss of these vessels, the *Eclipse*, which has been connected with the whaling industry for the past fourteen years, was sold to Norwegian owners in the early part of the year. There will be a fresh addition to the fleet this year in the *Seduisante*, a hardy-looking little two-masted ketch, which has been acquired by Mr. O. Forsyth Grant, of Ecclesegreigh, to replace the ill-fated *Snowdrop*. The following are the returns for the year:—

Ships.	Masters.	Voyages.	Whales.	Walrus.	Bears.	Tons, oil.	Cwts. bone.	Seals.
Balena	Murray.....	Greenland....	4	..	16	30	30	22
Scotia.....	Robertson .....	.....	8	...	10	75	75	4
Diana.....	Mackay .....	" .....	.....	.....	.....	.....	.....	1,564
Morning.....	Adams.....	"	2	.....	9	30	30	27
Active.....	Murray.	"	1	480	150	10	4	247
St. Hilda.....	Cooney.	Davis Str.....	1	240	.....	..	.....	.....
Two trips.								

TOTAL yield compared with last season.

—	Whales.	Bone.	Oil.	Seals.	Walrus.
		Cwts.	Tons.		
1908.....	15	170	120	1,943	740
1909.....	15	139	185	1,864	730

J. E. BERNIER.

APPENDIX X.

COPIES OF DOCUMENTS FOUND BY COMMANDER J. E.
BERNIER IN 1908—LEFT BY COMMANDER HENRY
KELLETT, OF H.M.S. 'RESOLUTE,' IN
1853-4, ON DEALY ISLAND

His Britannic Majesty's ships *Hecla*, Lieut. William Edward Parry, Commander, and *Griper*, Lieut. Matthew Liddon, Commander, being an expedition for the discovery of a northwest passage, wintered in the harbour near this place, A.D. 1819-20. The latitude of the anchorage was found to be $74^{\circ} 47m. 10s.$ The longitude, $110^{\circ} 47m.$ West of Greenwich. The dip of the magnetic needle, $88^{\circ} 37m.$, and its variation, $127\frac{1}{2}^{\circ}$ easterly. This expedition advanced during the summer of 1819, as far as the meridian of 113° , having discovered an outlet from Baffin's bay into the Polar sea, through Sir James Lancaster's sound. The strait through which their passage was effected (being a prolongation of Lancaster's sound), was named Barrow's strait. About the longitude of $89\frac{1}{2}^{\circ}$, they discovered and sailed into an inlet (named Prince Regent's inlet) as far south as latitude $71^{\circ} 54m.$ In longitude $92\frac{1}{4}^{\circ}$, the north shore of Barrow's strait ceased to be continuous, and between $93^{\circ} 40m.$ and 114° , in latitude 74° to $75^{\circ} 15m.$, nine islands were discovered, and named the Islands of New Georgia, in honour of His Majesty, King George the Third.

The expedition sailed from hence in the summer of 1820, in prosecution of their enterprise, being in good condition, and having 16 months' provision and fuel on board.

W. E. PARRY,

MATTHEW LIDDON,

Commander of the 'Hecla.'

Commander of the 'Griper.'

ESKIMAUX AND ENGLISH VOCABULARY FOR USE OF THE ARCTIC EXPEDITION.

Published by Order of the Lords Commissioners of the Admiralty.

LONDON: JOHN MURRAY, ALBEMARLE STREET, 1850.

LONDON: PRINTED BY HARRISON AND SON, ST. MARTIN'S LANE.

CONTENTS.

PAGE.

The reader is requested to make the following corrections in the Labrador column with his pen:—

Aground	ikkarpok	Flesh	nerke
Backward	uttimut	Flight	kemmawok
Black, it is	kernertak	Foot	ittigak
Bleeds, it	aukpok	Fox	terrienniak
Blood	auk	Glutton	nerriwaksóyok
Blubber	orksuk	Grouse	akkigilek
Blue	tung-ayoktamik	Gull	nauyak
Blunt	kenakang-íok		
Body	íime	Half	koppako
Borrow	akkelik-sarsiwok	Hare	uk kalek
Bow, he shoots	pitiksarpok	Head	kavsek
with a			
Branch	akkerok	If	dele ob; margat
Brass	kaggordlek	Infant	nutarak
Bread-dust	sennaugak	Inside	illua
Breast of a man	sag-wik		
Bribe	sagwang-ítome	Jacket, under	attigék
Build	igluliorpok	Language	okautsinik
Calm, it is	annore-karung- nerpok	Married	nulliarék
Candle	nennergoak	Medicine	aniasiumik
Canoe, he paddles a	kaiyaktorpok	Mouse, field	nunniwak
Carry, to	nangmarlugo	Mud	ipak
Climbs, he	mayurarpok		
Comb	illiyaiyutit	Net	nullutset
Coughs, he	koertorpok	North, to the	awung-aling-awok
Crab	naularnak		
Drills, he	illioru-miktorpok	Oversets, it	oggowok
Egg	mannik; pl. mannit	Plait, I	peraivung-a
Eyelash	kemmeritset	Rain, to	kiviklugo
Face	kenak	Scar (wound)	killek
Father-in-law	sakke	Sign	nellunaikulak
Fine, it is	sillakikpok	Signal, with a flag	saimadlik
Finger, fore	tikke	Sings, he	img erpok
Flame	ikkomaksab ikkoad- larning-a	Sling	ayektaut
		Wave	malle; pl. mallit

PREFACE.

The following vocabulary is compiled for the use of the Arctic expeditions, fitted out at the expense of the British Government, to carry relief to Sir John Franklin and his companions. It was begun specially with a view to the Behring Strait expedition, as we learn from the accounts of Cook, Kotzebue, and Beechy, that much intercourse took place during those voyages with the natives of the north-western coast of North America. It may also prove useful to the expedition about to sail for Lancaster sound.

The only existing published vocabularies of the Eskimaux language are contained in Fabricius's 'Greenland and Danish Dictionary,' 1804; in the account of Parry's Second Voyage in the years 1821-3; in Beechy's 'Voyage of the Blossom in 1824-5'; and in Sir John Ross's Voyage in 1829-33. The three last-mentioned are thick quarto volumes, and therefore of little use in that form for the daily requirements of parties absent from the ships in boats or on land expeditions. The object of the present work is to supply that want, and to furnish every officer and leading man in the Arctic expeditions with a book of ready reference that he can carry in his pocket without inconvenience.

The vocabulary is drawn up in three parallel columns, consisting of the dialects as spoken by the natives in Kotzebue sound, in Melville peninsula and on the coast of Labrador. The authority for the first, which may be termed Western Eskimaux, is Beechy's 'Voyage of the Blossom,' above referred to, with the addition of a few words from a manuscript vocabulary of the late Captain Wolfe, R.N., who was a mate of the *Blossom* in her voyage to Behring strait. The authority for the dialect spoken at Winter island and Iglulik, which for distinction's sake may be called Central Eskimaux, is Sir Edward Parry's Second Voyage, evidently a carefully drawn up list of eight hundred words, to which have been added a few words from the only remaining fragment of an extensive vocabulary collected by Sir John Richardson, during a winter passed at Fort Franklin, from a native of Hudson bay, but which was unfortunately lost. For the Labrador or Eastern Eskimaux, I am indebted to the kindness of the Rev. Peter Latrobe, well known as secretary, and to Mr. Malla-

lieu, treasurer, to the Moravian Mission in London, who procured for me a translation by Messrs. Kmoch, Herzberg, Morhardt, and Stock, and especially by the Rev. Z. Glitsch, all of whom have resided many years at the missionary settlements at Okkak, Nain, Hopedale, and Hebron, on the coast of Labrador.

The people, whom we term Eskimaux, but who call themselves Innuït, are spread along the whole of the northern coast of America from Behring strait on the west to Greenland on the east; and there is little doubt but that the same language is understood throughout that extent, varying, of course, in dialect, but radically the same. We know, too, that Augustus, Franklin's interpreter from Hudson's bay, had no difficulty in conversing with the natives immediately to the west of Mackenzie's river, in 137 degrees west longitude. It may, therefore, fairly be presumed that the Labrador vocabulary, the only complete one of the three, will prove useful on whatever part of the shores of the Arctic sea the navigators may chance to meet with the natives.

As before mentioned, these people call themselves Innuït, and do not know the word Eskimaux. This name, it is believed, is first mentioned by Charlevoix in his '*Histoire de la Nouvelle France*,' who says that the natives of the coast of Labrador, who then extended southwards to the River St. Lawrence, were called Eskimantik (that is, 'raw fish eaters,' in the Mohican idiom) by their neighbours, the Abenakis, with whom they were commonly at war. If this is the true derivation of the name, it appears that the Eskimaux are only known to the civilized world by a nick-name given by their enemies.

If the extent of country be considered, the Innuït or Eskimaux is one of the most widely spread nations on the globe. We find them in Behring strait, occupying both sides of the strait, the Asiatic as well as the American; as the stationary Chukchis of Chukchi Noss and Anadyr are doubtless Esquimaux, and many of their words are the same as those in use in Greenland. From Kotzebue sound and Icy cape they have spread eastward along the shore of the Arctic ocean by the Colville, the Mackenzie, the Coppermine, and the Great Fish rivers to Melville peninsula, and to Fort Churchill in Hudson bay. They occupy the whole of the great peninsula of Labrador and the east coast of Hudson bay as far south as East Main river; also the islands between the north coast

of America and the pole as far as they are habitable, as well as both shores of Greenland, thus ranging through 140 degrees of longitude, or an extent of 3,500 miles.*

The inquiry into the connection between the dialects spoken by this widespread nation and those spoken by the several tribes of Russian America, is one of high interest. Inhabiting the north-western extremity of America, these latter are divided from Asia only by the narrow channel of Behring strait, so that of all nations of the New World they are nearest in contact with those of the Old. The generally received opinion as to the peopling of America is in favour of the passage from the old continent to the new having taken place by Behring strait, where the shortest distance to be traversed does not exceed fifty miles; a careful comparison, therefore of the languages spoken by the tribes resident on each side of the Strait might throw some light on this question.

As an example of the connection that exists between the Esquimaux, the Chukchi, and other dialects spoken by the tribes in that region, I have inserted at the end of this vocabulary, a comparative table of a few words taken from Balbi's '*Atlas Ethnographique*,' some of which show a great similarity, and there can be little doubt that they belong originally to the same language. Those who have leisure to pursue this subject, will find some useful information in the 2nd volume of the *Archæologia Americana*, in a paper by Dr. R. G. Latham, in the *London Ethnological Journal*, and in Baer's '*Statische und Ethnographische Nachrichten*,' which contains the words collected by Admiral Von Wrangell in these regions.

A few words of explanation are necessary as to the orthography adopted in this vocabulary. It is very nearly the same as that first suggested by Sir William Jones in the Preliminary Discourse to the Asiatic Researches, vol. I, and since adopted by the Asiatic and Geographical Societies of London. The consonants retain their English value, and the vowels have the same invariable sound as in the German, Italian, Spanish, and other languages. Many reasons might be urged in favour of this system, but it will be sufficient in the present case to say that it is the same that has been pursued in the translation of the Bible into the Greenland and

* Wrangell's *Nachrichten uber die Russischen Besitzungen in Amerika*, p. 280.

Labrador dialects of Eskimaux. In order to save the reader trouble, the scheme is repeated at the foot of every page of the vocabulary, and it may be permitted to express a hope that all collectors of vocabularies will in future adopt the same system; or substitute a better scheme, and adhere to it. The scheme is as follows:—

‘A’ is to be sounded as in the English word ‘father’; ‘a,’ dotted (the thick sound of ‘a’ common among the natives), as the ‘u’ in ‘but.’

‘e,’ as in ‘there’;

‘o,’ as in ‘more’;

‘ai,’ as ‘i’ in ‘time’;

‘ok,’ as in ‘oak’;

‘g,’ as in ‘get’;

‘i,’ as in ‘ravine’;

‘u,’ as in ‘flute’;

‘au,’ as ‘ow’ in ‘how’;

‘ch,’ as in ‘church’;

‘kh,’ as ‘ch’ in ‘loch’;

‘r’ and ‘s,’ dotted, require a forcible, or, if the term may be allowed, a guttural sound of those letters.

Every vowel is to be sounded. The accent marks the emphatic syllable. The hyphens are only inserted for facility in reading.

At the conclusion of the vocabulary will be found a specimen of some dialogues on first meeting with the natives, on preparations for an exploring expedition, the purchase of dogs, sledges, &c., with a few sentences to explain to the Eskimaux the object of the present expedition, and that a large reward will be given to any one who will first bring the joyful intelligence of the safety of Sir John Franklin and his companions.

JOHN WASHINGTON,

LONDON, March 1, 1850.

Captain, R.N.

BRIEF SKETCH OF THE ESKIMAUX GRAMMAR.*

The language of the Eskimaux is far from being rude or imperfect. It abounds in words expressive of common objects, and distinguishes slight shades of difference by appropriate terms.

*Chiefly from Crantz’s History of Greenland, Vol. I, chap. vi., p. 201, and Parry’s Second Voyage, 1821-3.

Animals of the same species receive peculiar names according to varieties of age, sex, or size. The verb to fish is expressed by a different word for each kind of fish. Much, therefore, may be said in a few words, and with precision; but, as might be supposed, the language has no words for abstract ideas. The words are variously inflected, but according to certain rules, and provided with numerous affixes and suffixes, which renders the language graceful and energetic. Many words are connected together, or, as Humboldt happily expresses it, joined by agglutination, and blended into one, so that, like the North American Indians, they can express themselves at once with strength and brevity. This circumstance, however, renders it very difficult for a stranger to acquire a knowledge of it; and that only after a residence of some years among the natives.

Several of the letters in the English alphabet are wanting in the Eskimaux language, as *f*, *j*, *q*, *x*, *z*; and in the annexed vocabulary, of more than 2,000 words, *b*, *d*, *g*, *l*, *q*, and *r*, rarely or never begin a word; *k* is the letter of most frequent occurrence.

The *r* and *s* are pronounced much more forcibly than is usual in English. Sir Edward Parry says the *r* approximates to the Northumbrian ‘burr,’ and the *s* to the *ch* in the Scottish word ‘loch.’ The letters *ng*, followed by a vowel, as *ang-ut*, *male*, and *ping-ahuk*, three, are sounded invariably as in German, or as in the Scottish name ‘Ang-us,’ or as in the English word ‘hanger,’ and not as in ‘anger.’ The Eskimaux commonly vary the pronunciation of their words, without altering the sense, and particularly so the women, who seem to be fond of the termination *ng*, as *hiuting-a*, ear, for *hiutiga*; and *niakoa*, head, for *niakok*.

The accent generally falls on the last syllable.

The nouns substantive, as well as the verbs, have a singular, dual and plural form; they have no distinction of gender, and no article. The dual generally ends in *k*, and the plural in *t*, but there are exceptions.

Singular.	Dual.	Plural.
Nuna (land)	nuneik	nuneit
Norrak (calf)	norrek	norret
Uyarak (stone)	uyarkek	uyarket
Iglo (house)	igluk	iglut
Innuk (man)	innuk	innuit
Tuktu (reindeer)	tuktuk	tuktut

Nouns may vary to a great extent: as diminutives, e.g., *nunar-suk*, a small land; as augmentatives, as *nunarso-ak*, a great land.

The declension of nouns is simple. The genitive only adds a 'b' (or an 'm' before a vowel) to the last syllable.

The personal pronouns always follow the verb. They are:—

U-ang-a—I
Igwit—thou or you
Oma—he

U-a-gut—we
Illipsi—ye
Okkoa—they

Apparently, a part of these pronouns is suffixed to the nouns as possessive pronouns; as:—

Nuna—land
Nuna-ga—my land
Nun-at—thy land
Nunang-a—his land
Nuna-rwut—our land

Nuna-rwuk—land of us two
Nuna-rse—your land
Nuna-rsit—the land of you two
Nuna-it—their land
Nuna-ik—the land of those two

The prepositions, if words may be so called which always follow the noun, are: mik, signifying at, with; as iglu-mik-pok, he is at the huts; mit, from; as nuna-mit, from land; mut, to; as u-agna-mut, to the westward; mi, in or upon; as unia-mi, in the ship; sikko-mi, upon the ice; and Crantz adds kut and agut, through and round.

The verbs have been divided into four conjugations, according to their terminations:—

1—in kpok, as	ermikpok,	he washes himself
2— rpok, as	mattarpok,	he undresses
3— pok, as	egipok,	he throws away
4— ok and wok, as	piyok,	he receives, and assawok, he loves.

The negative form of the verb is marked by the termination ngilak: thus, erming-ilak, he does not wash himself.

There are three tenses: present, ermikpok; past, ermisawok and ermigomarpok; the first expressing simple futurity, the last denoting decision. In like manner the imperative mood is of two kinds, the one gently reminding, as ermina, pray wash yourself; the other commanding, as ermigit, wash yourself.

The third person singular may be considered the root of the verb, and generally ends in ok; and most of the verbs in the vocabulary are inserted in this person.

The verb piwok is of constant use, somewhat similar to the English words get and do; it is difficult to assign its meaning—perhaps to obtain or accomplish.

It requires much study to master the inflections of the verbs, and they are too numerous to be entered upon here. The following may be taken as a specimen:—

Ermik-ponga.....	I wash
— potit.....	thou wastest
— pok.....	he washes
— pogut.....	we wash
— poguk.....	we two wash
— potik.....	you two wash
— pose.....	you wash
— put.....	they wash
Nappa-lang-a.....	I am well
— latit.....	thou art well
— lak.....	he is well
— lagut.....	we are well
— lase.....	ye are well
— let.....	they are well

The participle, which supplies the want of an adjective, is the same as the preterite of the indicative: as ermilaupkok, one who washes; in the future, in makes ermissir-sok, about to wash.

The conjunction *lu* (and) is added to the end of the word, like the Latin *que*. A common interjection is *Hei!* or *Hei-ya!* but a great degree of astonishment mixed with pleasure, is expressed by the word *Atamna-trani!* according to Parry; or *Tatamnamak!* in Labrador.

The numerals in general only extend to five, occasionally to six, and then begin again. In the Labrador dialect they are as follows:

Attau-sk.....	one
Maggok.....	two or seven
Ping-asut.....	three
Sittamet.....	four or nine
Tedlima.....	five
Ping-asu-yoktut.....	six
Sittamau-yoktut.....	eight
Tellimau-yoktut.....	ten

Six and seven are sometimes expressed by *argwenrak* and *argwenrak-towa*, respectively. In counting, they use their fingers; but Sir Edward Parry says, at Melville island they did not use their toes to count, as in Greenland.

The form of answering a negative question differs from any European language: thus the reply to *piomang-ilatit?* will you not have it? must be *nagga*, no, if the affirmative be intended; on the contrary, if the offer is declined the answer is, *Ap*, *pionang-ilang-a*; Yes, I will not have it.

The Eskimaux make much use of winks and nods in convers-

ing; the former are always intended to convey a negative meaning. A nod, as with us, implies an affirmative.

It may be useful to add that in the vicinity of Behring strait (as we learn from Beechy's 'Voyage of the Blossom,' and more recently from Captain Kellett), holding up the arms at an angle of 45 degrees on first meeting the natives, whether in a boat or on land, is a sign of peace and friendliness, and on coming to close quarters rubbing noses is the most approved mode of salutation. Also, that if a line be drawn on the ground round a party of Europeans engaged on shore or on the ice in making observations, or otherwise not wishing to be disturbed, the natives will understand that it is intended as a barrier they are not to pass, and, generally speaking, will respect it.

BY THE COMMISSIONERS FOR EXECUTING THE
OFFICE OF LORD HIGH ADMIRAL OF THE UNITED
KINGDOM OF GREAT BRITAIN AND IRELAND, &c.

Whereas it is necessary to replenish Her Majesty's sloop *Plover*, at Point Barrow Behring strait, with stores and provisions, as well for the future supply of that vessel, as for the purpose of meeting the wants of the crews of the *Enterprise* and *Investigator*, should those ships be driven back upon Behring strait, or should circumstances have rendered it imperatively necessary for the crews to abandon them, a course stated by Commander McClure (in a letter dated July 20, 1850, to Captain Kellett) 'he might be compelled to adopt after the winter of 1852, by proceeding in the spring of 1853 to quit his vessel with sledges and boats, and make the best of his way to Ponds bay, Leopold harbour, the Mackenzie river, or for Whalers, according to circumstances.'

With the view, therefore, of conveying assistance to the ships at Behring strait, we have appropriated the *Rattlesnake* for this service, and we have appointed you to the command of that ship, with a full reliance on your acquaintance with all that is necessary for carrying out the same, and on your personal knowledge of the coast on which you are to be employed. In furtherance of this

object, you are hereby required and directed to put to sea so soon as the *Rattlesnake* shall be in all respects ready, and to use every exertion to be off Cape Lisburne, Behring strait, at as early a period of the year as possible. In order to aid in this purpose, a steamer will be directed to tow you clear of the channel, and you will, after watering, if necessary, at Madeira, Teneriffe, or Cape de Verdes, proceed direct to Cape Virgins, on the eastern side of the Strait of Magellan, where a steamer will meet you from Rear Admiral Henderson's squadron, and will tow you through the straits, and as much further on your voyage as circumstances will admit. You will then proceed to Valparaiso and replenish with provisions, and other stores, and from thence continue your voyage to Honolulu, in the Sandwich islands; and, having taken on board whatever may be required, especially potatoes, and other vegetables for your own ship, as well as the *Plover*, you will, without any unnecessary delay at that port, proceed direct for Clarence harbour in order to ascertain if any party or later intelligence from the *Plover* shall have arrived there, and failing this, you will use your best endeavours to proceed with the *Rattlesnake* to Cape Lisburne, where you will probably meet with the officer, and boat's crew, of the *Plover*, which Commander Maguire in his letter to the Secretary of the Admiralty, No. 38, of the 20th August last, states will be at that point on the 15th July, 1853.

You will deliver to this officer the accompanying despatch for Commander Maguire, and of which you have a copy, together with a copy of your own orders, and supplying him with what his boat can carry, and may most desire, making sure of your return with the *Rattlesnake* to Grantley harbour, Port Clarence, before the season of 1853 is too far advanced.

Your ship is in all respects fitted and provided for the service upon which you are employed, and you are well acquainted with all that is necessary on such occasions for the health of those under your orders, and for the security of Her Majesty's ship. You will employ your people as far as is practicable in the winter months, in the preparations necessary for every operation in the spring, or so soon as the opening of the ice will admit of carrying supplies to Commander Maguire, or to other points, as circumstances may determine.

You will take every means of leaving proper records of your

condition and intended proceedings, and of the positions where you may have deposited provisions; taking as your guide for the distinctive mark of such records, the instructions contained in par. 7 of Our Orders to Sir E. Belcher, and Sir E. Belcher's direction in his letter to the Lords of the Admiralty of the 29th May, 1852, in furtherance of these orders. And you will also convey every information to us by the whale ships which pass through the strait on their return to the respective countries to which they belong; you are not to confine your communications to one ship alone, but by every opportunity to keep us informed of every circumstance connected with your own ship, and also the *Plover*.

In the summer of 1854 a vessel will be dispatched at as early a period as possible, and by that means you will receive instructions as to your future proceedings, which may depend on the information which may reach England from Sir Edward Belcher, or from the western coast; but should, from any unforeseen circumstance, no vessel be able to reach Clarence harbour, it is our wish, that before the close of the season of 1854 you should deposit your spare provisions and stores, with a boat, at your winter quarters, and then proceed to Honolulu, and there wait our further orders; and in anticipation of such departure it would appear to be necessary, that during the winter of 1853, and spring of 1854, you should construct a house at Clarence harbour capable of containing about 70 persons, and made as complete as circumstances will admit, for the shelter of Captain Collinson's expedition, should they have left their ships, either in boats or by land, and fall back upon that place.

It will be advisable in the spring of 1854, to forward travelling parties towards the northern shore, for the purpose of inquiring whether anything can be traced of Captain Collinson's party, or of any men from the *Plover*, and as you will receive considerable assistance in this object from the Indians, whose settlements are in the vicinity of your winter quarters, you are to cultivate their good feelings by every means in your power, and to take care that no cause of offence be given to them, and for all supplies of provisions which their hunting parties may procure you are always to pay in a liberal and proper manner.

You are supplied with all documents and papers connected with the various polar searches, and in closing these orders, we have to

express our confidence in your ability, and to leave you to act in such manner as will best fulfil our intentions.

Given under our hands this 9th February, 1853.

(Signed) J. R. G. GRAHAM.

HYDE PARKER.

M. F. F. BERKELEY.

To

To be left after you have read it.

HENRY TROLLOPE, Esq.,

Commander of H.M.S. *Rattlesnake*,
at Portsmouth.

By command of their Lordships,

W. A. B. HAMILTON.

ADMIRALTY, February 15, 1853.

SIR,—I am commanded by my Lords Commissioners of the Admiralty, to signify their direction to you to use your own discretion as to quitting your present quarters after the receipt of this, and endeavouring to secure the *Plover* for the winter in Grantley harbour; but should you deem it prudent to remain where you are for the ensuing winter, my Lords desire you will use your utmost endeavours, as soon as the season will permit in 1854, to reach the winter quarters of the *Rattlesnake* in Grantley harbour, so as to effect a junction with that ship in time to make the necessary exchanges between the two crews, and receive the needful supplies before the *Rattlesnake* shall have been compelled to quit Behring strait, in the autumn of 1854, on her return to this country.

2. In the event of your remaining this winter in Moore harbour, you are to employ yourself in depositing all the supplies you can spare for the relief of any party that might reach that neighbourhood from Captain Collinson's, or Commander McClure's ship. You will also extend your parties right and left along the shore, in such direction as may be advisable, as far as may be prudent, in order to deposit notices of your proceedings and intentions, and of the store of supplies left at Moore harbour.

3. Before quitting Moore harbour, you will erect such house or place of shelter for any arriving party as your means will permit, and even if you should be unable to move the *Plover* round to

Grantley harbour, you and your people are at all events to make good your retreat to the quarters to be provided in that harbour by Commander Trollope.

4. For directions as to the course to be adopted in depositing notices of your intentions, and of the supplies left in Moore harbour, their Lordships refer you to their instructions to Sir Edward Belcher, and to the further remarks on that subject contained in Sir Edward Belcher's letter to the Secretary of the Admiralty, of the 29th May last from Whale Fish islands.

I am, sir,

Your most obedient servant,

W. A. B. HAMILTON.

Commander MAGUIRE,

H. M. Discovery Ship *Plover*,

Moore Harbour, Point Barrow.

or to any officers of the *Plover*,

at Cape Lisburne.

LIST of provisions, stores, &c., landed on the 'Princess Royal Islands,' by H. M.'s Dy. Ship *Investigator*, on the 3rd day of March, 1851.

Flour.....	5,588 lbs.
Preserved meat.....	2,238 "
Salt pork.....	1,920 "
Preserved potatoes.....	1,344 "
Sugar.....	392 "
Chocolate.....	324 "
Rum.....	26 gallons,
A whale boat and gear complete, ammunition, etc.	

LIST of provisions, stores, &c., landed and remaining on board
H. M.'s D. Ship *Investigator*, in the Bay of Mercy, Baring's
Island, abandoned by the crew on the 3rd day of June, 1853.

Articles.	Quantity Landed.	Remaining on Board.
Biscuit.....	1,000 lbs.	3,836 lbs.
Rum (Con.).....	26 galls.	52.24 galls.
" Mixed.....	.....	36.1 g. and Ull.
Brandy.....	20 galls.	30.4 "
Wine.....	.....	28 "
Salt beef.....	608 lbs.	304 lbs. and Ull.
Salt pork.....	1,600 "	320 "
Preserved meat.....	3,000 "	4,652 lbs.
Flour.....	6,420 "	960 lbs. and Ull.
Suet.....	112 "	112 "
Peas.....	10 B. 4 G.	3 B. 4 G. & Ull.
Potatoes.....	784 lbs.	112 lbs. and Ull.
Sugar.....	1,000 "	500 "
Chocolate.....	435 "	Ullage.
Tea.....	126 "	"
Oatmeal.....	.....	30 galls.
Vinegar.....	.....	1,118 lbs.
Tobacco.....	482 lbs.	385 "
Soap.....	349 "	1,100 lbs. and Ull.
Pickles.....	.....	194 lbs.
Carrots.....	.....	345 lbs. and Ull.
Lemon juice.....	.....	11 No.
Blankets.....	32 in No.	584 yds.
Flannel.....	230 yds.	24 in No.
Serge frocks.....	50 in No.	10 yds.
Blue Cloth No. 2 for jackets.....	64 yds.	.....
Flushing.....	25 "	.....
Boots.....	7 pairs	9 pairs
Shoes.....	15 "	7 "
Blue cloth jackets No. 2.....	49 No.	.....
" trousers No. 2.....	11 pairs	.....
Duck.....	150 yds.	174 yds.
Stockings.....	40 pairs	26 pairs
Mitts.....	150 "	114 "
Caps.....	30 No.	12 No.
Blue serge.....	.....	74 yds.
Shirts.....	.....	59 No.
Black silk handkerchiefs.....	.....	122 No.
Flushing jackets.....	30 No.	12 "
Badges, 1st class.....	.....	20 "
" 2nd class.....	.....	20 "
Wrappers.....	13 No.	44 "
<i>Presents.</i>		
Box cloth jackets.....	11 No.	.....
" trousers.....	12 pairs	.....
Guernsey frocks.....	21 No.	.....
" drawers.....	3 pairs	.....
Boothose.....	.....	.....
Comforters.....	2 No.	.....
Box cloth boots.....	25 pairs	.....
Seal skin boots.....	27 "	6 pairs
" caps.....	20 No.	.....
" gloves.....	47 pairs	.....
Sea boots.....	9 "	.....

LIST of provisions, stores, etc.—*Continued.*

Articles.	Quantity Landed.	Remaining on Board.
<i>Presents—Con.</i>		
Welsh wigs.....	12 No.	
South-wester.....	1 "	
Green crape.....	30 yds.	100 yds.
Needles, thread, &c.....		
Carpet boots.....		3 pairs
Musket ball cartridge.....	200 No.	
" blank cartridge.....	1,000 "	
Caps, percussion.....	1,000 "	
" musket.....	1,500 "	
Shot.....	112 lbs.	
Paper, white.....	4 quires	
Papers, percussion.....	4 No.	
Fowling piece (double).....	1 "	
Boats and gear (complete).....	6 "	
Topmast.....	1 "	
Jib boom.....	1 "	
Hand mast.....	1 "	
Spars, small.....		
Chest of carpenter's tools.....	1 No.	
Mahogany plank.....		
Deals, ordinary.....		
Grindstone.....	1 No.	
Boat's coppers.....	2 "	
Anchors, boats.....		
Pumps, boats.....		
Crosscut saw.....	1 No.	
Empty casks.....	100 "	
Quarter deck housing.....	1 "	
Laboratory tent.....	1 "	
Coals.....	7 tons	

ROBERT McCLURE,
Commander.

COPY OF A NOTICE LEFT IN THE BAY OF MERCY, BARING'S ISLAND.

NOTICE.

This mark was erected by the crew of H. M.'s Dy. Ship *Investigator*, which entered this bay on the 24th September, 1851, and remained until this date, when the crew by the order of Captain Kellett, C.B. of H. M.'s Ship *Resolute* (Melville island), abandoned the ship.

A large depot of stores has been left on shore 1,000 yards south of this (4 months' for 66 men).

Depots have also been left by Captain Kellett at the under-mentioned places on the opposite side of these straits, viz:—

Dealy Island.—210 days for 66 men, with stores, &c., to assist a party wintering out here.

Assistance Harbour.—7 men, for 91 days.

Cape Cockburn.—14 men, for 91 days.

Winter Harbour.—10 days for 70 men.

Point Hotham.—2 casks of biscuit.

Given under my hand on board H. M.'s Dy. Ship *Investigator*, Bay of Mercy, Baring's island, latitude 74° 6m. N., longitude 117° 54m. W., 1st of June, 1853.

(Signed) ROBERT McCCLURE,
Commander.

A depot consisting of three months' provisions for 66 men, stores, boat, &c., was left on the 'Princess Royal' islands in the 'Prince of Wales' strait, in latitude 72° 47m. N., longitude 117° 34m. W., by the *Investigator*, in March, 1851.

LIST of provisions landed at Dealy island from H.M. ship *Resolute*, for the relief of distressed parties visiting it. July 21, 1853.

Provisions.	Quantity.	In what Packages.
Biscuit.....	1,980 lbs.	Tanks.
Flour.....	12,000 "	48 casks.
Rum, concentrated.....	166 galls.	3 "
Beef.....	4,840 lbs.	16 "
Bacon (The weight before boiling).....	4,679 "	14 "
Suet.....	112 "	1 "
Currants.....	200 "	1 "
Peas.....	106 galls.	3 "
Sugar.....	2,500 lbs.	6 "
Chocolate.....	926 "	5 "
Tea.....	200 "	2 "
Tobacco.....	346 "	2 cases.
Soap.....	417 "	4 casks.
Normandy pippins.....	600 "	Middle tank.
Preserved meats.....	3,465 "	4 lb. tins.
" vegetables.....	2,166 "	4 and 2 lb. tins.
" potatoes.....	2,080 "	11 casks.
" soup, ox cheek.....	868 "	Tanks.
Mustard.....	10 "	1 case.
Treacle.....	378 "	1 cask.
Baking powder.....	30 "	Middle tank.
Onion powder.....	204½ "	2 casks.

210 days for 66 men.

Warm clothing landed:—

Box cloth jackets.....	66 in No
“ trousers.....	66 pairs
Guernsey frocks.....	122 in No
Knitted drawers.....	108 pairs.
Fisherman's boots.....	63 “
Carpet boots.....	66 “
Boot hose.....	132 “
Mitts.....	143 “
Crape.....	59½ yards.

W. H. RICHARDS,
Clerk in charge.

SCALE of victualling for which provisions are landed.

	Flour or Biscuit.	Beef.	Bacon, boiled.	Preserved Meats.	Potatoes.	Vegetables.	Peas.	Sugar.	Chocolate.	Tea.	Rum.
	lbs.	lbs.	lbs.	lbs.	lbs.	lbs.	gill	oz.	oz.	oz.	
1st day.....	1	.....	.....	$\frac{3}{4}$	$\frac{1}{2}$	.....	.....	$2\frac{3}{4}$	1	$\frac{1}{4}$	
2nd day.....	1	1	.....	.....	.....	$\frac{1}{2}$	.....	$2\frac{3}{4}$	1	$\frac{1}{4}$	
3rd day.....	1	.....	$\frac{3}{4}$	.....	.....	.....	1	$2\frac{3}{4}$	1	$\frac{1}{4}$	$\frac{3}{4}$ of a ½ gill concentrated daily.

The remaining provisions are intended to be issued as circumstances may render necessary. The soup might be issued once a week at one-half pound per man, in lieu of vegetables or peas.

Dated on board H.M. ship *Resolute*, Dealy island, 21st July, 1853.

HENRY KELLETT,
Captain.

PROVISIONS in depot, East point, Fife harbour.

Beef.....	304 lbs.
Rum concentrated.....	30 galls.
Pork.....	320 lbs.
Sugar.....	110 "
Tea.....	20 "
Lime Juice.....	45 "
Flour.....	250 "

PROVISIONS in depot, seven miles east of Cape Cockburn.

Biscuit.....	1,000 lbs.
Rum concentrated.....	47½ galls.
Pork.....	640 lbs.
Sugar.....	100 "
Tea.....	40 "
Flour.....	250 "
Preserved meats.....	300 "

PROVISIONS in depot, East point, Assistance harbour.

Biscuit.....	284 lbs.
Rum, concentrated.....	17½ galls.
Sugar.....	50 lbs.
Tea.....	20 "
Boiled bacon.....	216 "
Flour.....	250 "
Preserved meats.....	266 "

HENRY KELLETT,

*Captain.*STORES landed in depot on Dealy island from H.M. ship *Resolute*.

July, 1853.

Gunners.

Powder, sporting.....	4 lbs.
" fine grain.....	15 "
Cartridge, ball, musket.....	500 in No.
" blank.....	500 "
Caps, percussion, musket.....	1,000 "
" Fowling piece.....	1,000 "
Rockets, signal, ½ lb.....	12 "
Sticks for D.....	10 "
Portfires.....	20 "
Blue lights.....	12 "
Maroons.....	20 "
Spare nipples.....	2 "
" Nipple.....	1 "
Wads.....	4 bxs.
Paper, purple.....	2 quires.
Loose ball.....	500 in No.
Shot lead, No. 2.....	56 lbs.
" Ducq.....	56 "
Slow match.....	30 "
Hudson Bay guns.....	2 "
Tents, marquee, complete.....	1

Carpenters.

Pickaxes.....	2 in No.
Chisels.....	3 "
Mallets.....	1 "
Plane.....	1 "
Saw, hand.....	1 "
Ten m.....	1 "
Files.....	3 "
Axe.....	1 "
Adze.....	1 "
Cotton wicks.....	4 lbs.
Nails, iron, 30.....	4 "
" 20.....	4 "
" 10.....	3 "
" 6.....	3 "
" 4.....	3 "
" 2.....	3 "
" tacks.....	2 "
Copper brat.....	4 "
Chalk.....	2 "
Seal oil.....	65 galls.
Portable oven and wash-house stove.....	1 in No.
Candles.....	50 lbs.

Boatswains.

Palm sailmakers.....	1 in No.
Needles, sail.....	12 "
Twine.....	1 lbs.
Rope, 2 inches.....	30 "
Spun yarn.....	20 "
Junk, 6 inches.....	4 "
Awls.....	6 in No.
Hemp.....	$\frac{1}{4}$ lbs.
Wax.....	12 yds.
Old canvas.....	1 in No.
Marling spike.....	1 "
Mallets, serving.....	2 "
Shovels.....	6 skeins.
Nettle stuff.....	$\frac{1}{4}$ lbs.
Bees-wax.....	$\frac{1}{2}$ oz.
Hog's bristles.....	1 in No.
Halket's brat.....	1 "
Union Jack.....	1 "

List of medicines, instruments, and surgical appliances, placed in the Depot house, Dealy island:—

Box No. 1.—Containing tow, cotton, lint, old linen, flannel and linen bandages, oiled silk, pins, adhesive plaster, tourniquet, elastic catheters (2), silver catheters (1), and pocket case of instruments, consisting of scissors, bistouries (2), knife (1), Seton needle, tenaculum, Assilini's forceps, forceps, ligature thread, needles, lancets (2), scalpels (2).

Box No. 2.—Contains purgative, sedative and cough pills, laudanum, purgative and aromatic powders, opium, collodion, glycerine,

spermaceti ointment, resinous ointment, calomel, tarter emetic, long splints (2), nitrate of silver, gallipots. Directions for their uses, and mode of application are inclosed in box No. 1.

Brandy, 1 bottle in No. 2.

WILLIAM T. DOMVILLE,
Surgeon of H.M.S. 'Resolute.'

(Copy.)

HENRY KELLETT, *Captain.*

LIST of articles deposited upon the north side of Melville island, on 14 July, 1853, latitude $75^{\circ} 30m$. N., longitude $109^{\circ} 40m$. W.:—

- 1 sledge with lashings, sheers, and drag ropes complete.
- 4 cross bars for satellite, and a few staves.
- 1 coverlet McIntosh cloth, lined with blanket.
- 9 felt sleeping bags.
- 10 pr. of canvas boots.
- 1 ammunition bag (containing remains of ammunition).
- 1 tin case of bacon—52 lbs.
- 1 tin case of pemmican—40 lbs.
- 1 bag of stearine—10 lbs.
- 2 bottles of onion powder.
- 2 bags of salt.
- 3 tins of Moore's chocolate.
- 1 canvas bag, containing 60 lbs. biscuit.
- Private clothing.
- Geological specimens and specimens of drift wood.
- 4 gutta percha depot cases.

N.B.—The sledge is stowed with all the above-mentioned articles, and the whole covered with the McIntosh cloth.

The top of the cairn upon the beach is just visible, over a ridge, and bears by compass N. 143° W., distant $\frac{3}{4}$.

At a distance of about 2 miles from the cairn, and nearly upon the same bearing, the following articles are left:—

- 1 cart, with drag ropes and lashings complete.
- 1 tin case of pemmican—20 lbs.

- 1 bag of biscuit—10 lbs.
- 1 bag of bacon—8 lbs.
- 1 bag of wicks and torches.
- 1 bag of stearine—4 lbs.
- 1 can of rum, concentrated—1½ gallons.
- 1 can of alcohol—1½ gallons.
- 1 bottle of curry powder.
- 1 bottle of onion powder.
- Tobacco.
- 2 sets of cooking utensils, complete, except 1 kettle and lamp.
- 1 tent for 9 persons fitted complete.
- 1 black waterproof cloth.
- 1 buffalo blanket.
- Saw, shovel, pemmican chopper and board, knapsack, pickaxe.
- 1 double barrel gun and gear.
- 1 McIntosh ammunition bag, for 'present use' ammunition.
- 1 sextant, Cary II 65. 3 inch.
- 7 water bottles.

The cart is stowed with the above-mentioned articles, and the whole covered with the black floor cloth.

(Signed) F. L. McCLINTOCK,
Commander.

(Copy.)

HENRY KELLETT, *Captain.*

*By the Commissioners for executing the Office of Lord High
Admiral of the United Kingdom of Great Britain and
Ireland.*

We have to inform you that we have dispatched Her Majesty's steam vessel *Phoenix*, under the command of Commander Inglefield, with the *Breadalbane* transport, to Beechy island, for the purpose of replenishing the ships under your command with stores and provisions, in case your supplies may have been so far reduced by the depot formed at Melville island, and the various cachets on the coast, as to prevent you from continuing further search for Sir

John Franklin, during this season and the winter of 1853-54 if the information you may have gained determine you to continue such further search.

2. In communicating with you on the subject of your former orders, and the service on which you are employed, we are aware how impossible it is for us to send out any definite instructions with reference to your future proceedings, when we are ignorant of the position in which you may now be placed, or whether any traces of Sir John Franklin's expedition may have been found during last autumn or the spring of this year, and what steps you may have considered it most expedient to adopt. But if no trace of the missing ships have been found beyond Wellington channel, and if it should appear that by the extended search you have been enabled to make in that quarter, that the missing ships did not proceed in that direction, and if Captain Kellett should have reached Melville island, as directed by his instructions, and his land expeditions should also have failed in finding any such trace, it does not appear to us that there is any other direction in which a prospect of their discovery can be expected. Every accessible part of the shores of the Polar seas, west of Lancaster sound, will have been visited without finding a trace of the missing ships, except their former station at Beechy island, in 1845-46. In such a contingency as this, and if such should likewise be your opinion, after mature consideration with the senior officers under your command, there appears no other course left but to abandon all further search.

3. But in case you should have found any trace of the expedition, it will be your duty to follow up that trace. In doing this you must exercise extreme caution so as not lose your means of communication with Beechy island; nor are you to incur any hopeless risk by proceeding beyond unreasonable limits, for the safety of your own crews must be your first care. We place every confidence in your zeal and intelligence, and feel assured that you will act with sound judgment in whatever situation you may be placed; we therefore leave it to you either to abandon the expedition altogether if you are of opinion that no further steps can be practically taken, or to send such of the ships to England as you may not require; transmitting by them to our secretary, not only a full account of all your proceedings, but charts of all your discoveries, and keeping us informed of your views and intentions, so that if it

should be necessary every requisite aid may be given you in the summer of 1854.

Before your final departure for the Polar seas, should you think proper to adopt that course, there appears one very important subject which will require your serious consideration; and that is the present position of the ships under the command of Captain Collinson and Commander McClure, which entered the ice to the N.E. of Point Barrow (Behring strait), the latter in August, 1850, and the former in July, 1851. These officers with their respective crews, may have been compelled by circumstances to abandon their ships. If such should be the case they may probably attempt to reach Melville island, and having had this in view, when you left England we directed in your instructions, that a depot of provisions and other stores should be formed at that island. From this position they will no doubt endeavour to make their way to Beechy island or Port Leopold. It will, therefore, be your duty before returning to England to be fully satisfied that a proper depot of coals, provisions, &c., had been formed at Melville island by Captain Kellett, and that clear information had also been left there, that similar supplies would be found at Beechy island.

This depot on Beechy island is to consist of a full store of coal, provisions, clothes, and other stores, and you will take care to have it most carefully secured against the depredations of bears or other animals; you are also to leave one of your ships there with or without a crew as you may deem most advisable, so that Captain Collinson or Commander McClure's parties may find every possible assistance which they may require, and have the means at their command of returning to England; but should you find it to be practicable to place the ship or a depot of stores in a more advanced position between Melville and Beechy islands, it might be expedient to do so. This is a point on which you can form a better judgment than we can. Our most anxious wish is to establish the best possible arrangement with a view of giving succour and support to the crews of those ships should they be compelled to seek refuge in the direction we have pointed out.

Having expressed these general views which will require your careful consideration, we leave it to you to take such steps as you

may consider most expedient for meeting the circumstances of the case.

Given in our hands this 11 day of May, 1853.

(Signed) J. R. G. GRAHAM.

HYDE PARKER.

M. T. T. BERKELEY.

R. S. DUNDAS.

ALEX. MILNE.

To

Sir EDWARD BELCHER, C.B.,

Captain H. M. Ship *Assistance*,

Arctic Seas.

(Copy.)

HENRY KELLETT, *Captain*.

SLOPS and warm clothing in depot at Beechy island, landed from H.M.S. *North Star*, 26 Feb'y, 1854:—

Articles.	Quantity.
Flushing jackets.....	100 in No.
“ trousers.....	50 pairs.
Blue knitted jackets.....	389 “
“ caps.....	100 “
Flannel.....	920 yds.
Serge.....	.....
Stockings.....	450 Pairs.
Mits.....	200 “
Blankets.....	300 in No.
Shirts.....	.....
Shoes.....	200 pairs.
Half boots.....	100 “
Felt blankets.....	95 in No.
Eskimaux boots.....	25 pairs.
Moccasins.....	100 “
Carpet boots.....	60 “
Boot hose.....	50 “
White knitted drawers.....	30 “
“ frocks.....	18 in No.
Blue baize frocks.....	6 “
Mits.....	200 Pairs.
Comforters.....	36 in No.
Welsh wigs.....	48 “
Sou westers.....	30 “
Spare soles and heels.....	100 pairs.

(Signed) WILL ELLICOTT,

Clerk in charge.

(Copy.)

HENRY KELLETT, *Captain*.

LIST of provisions on Beechy island and in depot at Cape Riley.
26 February, 1854:—

Biscuit.....	31,520 lbs.
Rum, concentrated.....	737½ galls.
Brandy.....	25 "
Flour.....	75,084 lbs.
Salt beef.....	32,180 "
" pork.....	8,792 "
Suet.....	2,268 "
Currants.....	200 "
Peas.....	565½ galls.
Oatmeal.....	20 "
Sugar.....	13,644 lbs.
Chocolate.....	2,365 "
Tea.....	1,128½ "
Vinegar.....	88 galls.
Tobacco.....	3,174 lbs.
Soap.....	1,704 "
Lemon juice.....	1,675 "
Preserved meats.....	15,874 "
" soups.....	6,744 "
" vegetables.....	9,544 "
Dried vegetables.....	858 "
Pickles.....	6,192½ "
Pepper.....	40 "
Mustard.....	262 "
Maccaroni.....	450 "
Rice.....	724 "
Bacon.....	2,660 "
Fine salt.....	170 "
Rock salt.....	60 galls.
Dates.....	50 lbs.
Cranberries.....	3,520 "
Dried apples.....	290 "
Normandy peppers.....	100 "
Dried chillies.....	5 "
Herbs.....	5 "
Essence of hops.....	20 "
" spruce.....	7 "
Dried yeast.....	43 "
Seed, mustard and cress.....	26 "
Finnan Haddock.....	200 "
Chocolate paste.....	50 "
Pemmican.....	1,497 "
Boiled bacon.....	676 "
Portable soup.....	335 "
Preserved milk.....	193 pints.
Onion powder.....	643½ lbs.

H.M.S. *North Star*, 26 Feb'y, 1854.

(Signed) WILL. ELLICOTT,
Clerk in charge.

H. M. SHIP 'RESOLUTE,'

IN BARROW STRAIT, May 8, 1854.

ACCOUNT of provisions landed at Cape Cockburn depot, *in addition* to those placed there in August, 1852:—

Biscuit...	320 pounds.
Preserved meats...	690 "
Boiled bacon...	496 "
Chocolate...	82 "
Sugar...	22 "
Tallow candles for fuel.. . . .	100 "

These articles complete the depot to 20 days' *travelling provisions* for 66 men.

There is also in addition to this proportion, 640 pounds of pork not boiled, and 250 pounds of flour.

The preserved meats are buried under the casks; the remaining provisions are securely stored in casks.

W. H. RICHARDS,
Clerk in charge.

Approved,

HENRY KELLETT, *Captain.*

At Assistance harbour, eight miles west of Cape Hotham, there is in addition to the provisions placed there in August, 1852, thirty days' travelling provisions for 66 men.

HENRY KELLETT, *Captain.*

REPORT OF J. G. McMILLAN, GEOLOGIST OF THE 'ARCTIC'
EXPEDITION, 1908-1909.

To the Hon. LOUIS-PHILLIPE BRODEUR,
Minister of Marine and Fisheries,
Ottawa.

Introduction.

The following report deals, from a geological point of view, with some portions of the Arctic islands of Canada, visited by the C.G.S. *Arctic*, during the seasons of 1908-9; and contains, besides, a short account of the voyage, physical features, structure, and geological formation of the islands, together with some observations upon the mineral resources and animal life of the region, and in oceanography.

The appendices contain reports by Mr. Lawrence M. Lambe, F.G.S., F.R.S.C., and Mr. W. J. Wilson, palæontologists of the Geological Survey, upon the fossils collected; and by Mr. J. M. Macoun, naturalist of the Survey, upon the plants of Melville island.

The western islands have not, hitherto, been visited by a geologist, and a special effort has been made to incorporate in this report all observations of the early explorers relating to the physical features and geology of this part of the archipelago. Much of this information has been published in rather inaccessible form, in blue books of the British House of Commons; and in this connection, special mention should be made of the journals of McClintock, Meehan, Osborn, and McClure, and of the geological summaries made by Haughton, by Dawson, and by Low.

The writer is specially indebted to Mr. G. J. Desbarats, Deputy Minister of Marine and Fisheries, and to Mr. R. W. Brock, Director of the Geological Survey, for every aid in equipment, and in the identification and description by specialists of the collections obtained, and to Dr. Haanel, Director of

the Mines Branch, for analyses of samples of coal and bituminous shale, and of sea water.

To Captain Bernier, the officers, and the men of the *Arctic*, thanks are due for assistance in carrying out the geological work of the expedition.

The Voyage to Melville Island.

On July 18, 1908, I had the honour to be commissioned by Mr. Desbarats, the Deputy Minister of Marine, to accompany, as geologist and naturalist, the expedition being sent out in the Canadian Government ship *Arctic*, under the command of Captain J. E. Bernier. Every facility was to be provided for the prosecution of the work, and particular attention was to be paid to the economic geology, character, and resources, of the territory visited.

Following the instructions received, I proceeded to Quebec, and joined the steamer on the morning of July 21. At noon of the 28th, towards the close of the celebration commemorating the three hundredth anniversary of the founding of the city, the ship weighed anchor, and proceeded down the St. Lawrence, amid the cheers of the various battleships in the harbour. Three British battleships passed us on the following morning, and various vessels were met with during the two following days.

On August 1, we entered the Gulf of St. Lawrence, and on the night of the 3rd, were blown through the Strait of Belle Isle in a gale. On the following afternoon we passed close to a magnificent iceberg which towered far above the mast-head, and in plain view of half a dozen others. Schools of whales, sometimes numbering six or eight, sported in the waters. On the course, which was due north, very little ice and little animal life was to be seen after the first day from Belle Isle, until the coast of Greenland was neared a week later.

The Arctic circle was crossed about midnight of the 12th, and on the 14th the large island of Disco hove in view on the starboard bow. As many as thirty icebergs could now be seen at one time, and fog for the most part obscured the coast. Towards evening the very high shores could be distinctly seen, surmounted in the interior by conical mountains of approxi-

mately equal height, which rose above the clouds. The upper half of these mountains (the elevation of which is given on the charts as 5,000 feet) is snow-covered throughout the year. Similar mountains on the mainland side of the Vaigat appeared in the bright sunlight to be ice-covered down to the sea. On the following day clouds and fog obscured Svarten Huk and the adjoining islands; but for an hour in the evening the sun illuminated the ice cap and the high conical hills of the mainland, and opened to view the coast from the stratified cliffs on the south to the bluff called Hope Sanderson by Davis.

Melville bay was crossed with a fair wind on the 17th, Cape York was reached the next morning, and in the afternoon the conical rock of granite near Parker Snow bay, and the high stratified cliffs of Wolstenholme island were left behind. About noon, several glaciers were seen, which discharge into the sea with width of about half a mile. The wind continued fair during the 19th, but falling snow obscured the coast south of Cape Alexander, during the forenoon. Foulke fiord or Etah was entered in the middle of the afternoon. The shores of this part of the coast are high; while in the interior, still higher ice-capped mountains may be seen from the sea. South of the inlet the strata, which is mapped as Huronian, lie horizontally or dip slightly towards the sea. In the bays and breaks in the cliffs many glaciers are to be seen. North of Etah the rocks resemble Laurentian, a reddish granite-gneiss being the most abundant about the inlet.

Despite the fact that Commander Peary had left for the north, the previous day, in the *Roosevelt*, taking 25 natives and some 200 dogs, the harbour presented a busy scene for $78^{\circ} 18'$ north. The *Erik*, of St. Johns, Newfoundland, chartered as an auxiliary steamer by Peary, was unloading coal at Reindeer point. Captain S. W. Bartlett was returning south along the Greenland coast with the *Erik* in the course of a few days, and kindly offered to take our last mail for the season. Mr. Craft, of the Carnegie Institute, who accompanied the *Erik*, was engaged taking magnetic observations. Mr. Harry Whitney, of New Haven, was making preparations for a winter's hunting in the Smith sound region. Boatswain Murphy and an assistant were in charge of the depot left by Peary. Half a mile within

the fiord were half a dozen huts of stone and earth, built into the steep hillside, occupied as winter dwellings by the remaining natives. It is the custom here as elsewhere for the natives to live in tents during the summer season, and two families still occupied their summer homes of canvas. Ordinarily the covering is made of sealskin from which the hair and dark outer surface has been removed; but where canvas can be procured, it is often substituted for the home product, by the natives who trade with the whalers.

At noon of August 20, the *Arctic* left the harbour of Etah, and proceeded direct for Lancaster sound. The weather during the next three days was clear; and we were afforded a much better view of Ellesmere island than we had secured of the Greenland coast. As Mr. Low reports just the opposite experience in 1904, it is likely largely a matter of accident what portions of the coast are distinctly seen. At best the days are comparatively few, during the summer season, when cloud and fog do not hang over the shores of Baffin bay. On the morning of the 21st, the high shores of Northumberland island were seen in the east, while to the westward the mountains of the eastern side of Ellesmere island presented a rugged appearance. Off the southeast coast of this island, half of which appeared to be occupied by glaciers, icebergs were quite numerous. Philpots island is comparatively flat, with three conical hills at Cape Horsburg in the northeast. Many large icebergs and pieces of loose ice were seen south of this island. Seals and walrus appeared to be more numerous here than at the other points visited. Hopes Monument is a conical rock which divides into two streams one of the large glaciers of the southeast corner of the island of North Devon. Though surmounted by the hills to the west, and they in turn by the Cunningham mountains, it makes a very prominent landmark.

The morning of August 3, found us close to the castellated cliffs of North Devon. These cliffs are formed of flat-bedded limestones which, to the westward of Croker bay, overlies the crystalline rocks of the eastern part of the island. The height of these cliffs facing the sea varies, according to Low, from 800 to 1,200 feet, and is greater near Cuming creek, where the

tableland reached by successive steps has an elevation of about 2,000 feet. The westerly dip of the strata carries the basal rock beneath the sea in the vicinity of Powell creek. The appearance presented is that of an arid region. Rain falls only during two months of the year, and there is little opportunity for solution; while during the other ten months, particles of snow and sand, driven by the fierce gales which sweep this region, are sculpturing the face of the cliffs and bringing out the inequalities in hardness of the rock surfaces exposed. No glaciers are to be seen in the western half of the island. Two factors tend to lessen the accumulation of ice. These are the reduced elevation of the limestone tableland as compared with the mountainous eastern part of the island, and the lessening precipitation as the distance from Baffin bay increases. Icebergs, too, are rare in the waters of Lancaster sound.

A depot of provisions and an ice boat were placed on Beechey island during the forenoon of the 24th, and three hours were afforded for the examination of the limestones here exposed as cliffs about 400 feet in height, rising nearly perpendicular from the sea on the south side of the island. The colour is a uniform greyish yellow. Shingle, rather than soil, covers the surface of the ground, and the area presents a very barren aspect. Some specimens of fossils were obtained from the lower layers, which were the only ones closely examined; and from under the shelter of the cliffs, a small collection of plants was secured. Large numbers of white whales were seen swimming about the shores of Erebus bay.

Proceeding from Beechey island the course was set westward towards Cornwallis island. On account of the weather being thick, with falling snow, the ship was anchored to an ice floe for seven hours during the morning of the 25th off the south point of the latter island. This was the only time the *Arctic* was delayed on the outward journey. Large masses of ice filled Allen bay, and numerous pans were scattered about between Griffiths and Cornwallis islands, while a long line of ice lay against Griffiths, Somerville, and Browne islands. The slightly westerly dip of the limestone is continued in Cornwallis island, reducing the height of the land in that direction. Bathurst island as seen in the distance, next morning, appeared

still lower, and was covered with the recently fallen snow. Byam Martin island, on the shores of which musk oxen were feeding, is comparatively flat. These were the first land animals seen, and one herd consisted of eight animals at least. The longitude of the eastern end of Melville island was reached during the evening. The low-lying land of this corner of the island was partially covered with snow. On the same day of the month when visited by the *Hecla* in 1820, and by the *Arctic* in 1906, the land was quite bare of snow.

During the morning of the 27th, several herds of musk oxen were seen feeding on the southern shores of Melville island, which as a rule slope very gradually to the sea. Some ice could be seen in the sound to the south; and as we passed along some miles off the coast, an occasional seal raised his head from the water to satisfy a very evident curiosity. At four o'clock in the afternoon, when near Cape Providence, the ship's course was changed to southwest. As we proceeded in this direction, first the end of Dundas peninsula, and then the distant shore of Liddon gulf, opened to view. No ice appeared in sight in this direction to westward. After a two hours' run some ice was met with, and the ship was headed back for Melville island. Another two hours and a depot of provisions, a boat, and some sleds were being landed for spring operations, at the mouth of a ravine some three miles east of Cape Providence. During the two hours occupied in securing the depot, the plain was reached two miles inland at an elevation of 600 feet. The bottom of the ravine, in this distance, had risen 200 feet; and it was inclosed by steep banks with beds of grey sandstone out-cropping at different levels. The upper bed is coarse and quite firm, the next finer and of a shaly nature, and the next lower fine-grained and siliceous. About one-third of the distance from the top of the bank, a half-inch layer resembling coal was noticed forming the top of a large piece of sandstone which had been loosened from its place by frost action, the effects of which were everywhere apparent. This layer was badly decomposed, and fragments only could be lifted in the hand. Some of the upper layers of sandstone not seen in place showed very flat ripple marks in one direction with others much less distinct at right angles to the former. About half way down a slab of red

sandstone showing remarkable cleavage was picked up. This piece, which resembled a board in shape, was 28 inches long, 6 wide and only $\frac{3}{16}$ thick. Within a mile of the beach and at an elevation of about 100 feet, a crumbling white sandstone of about the nature of bathbrick, outcropped in the side of the ravine. The different layers of this sandstone exhibited cross-bedding, the dip varying from the horizontal to an angle of 10 degrees west. Some of the loose material of a similar nature scattered about the delta contained what appeared to be minute decayed garnets. As evidenced by the amount of clay in the soil, layers of shale of considerable thickness are interposed between those of the sandstone. Large masses of this decomposed shale slide down from the steeper part of the side of the ravine during the summer season. Snow appears to slide down as well; and in one place when this had melted, walls of mud 10 feet high, at first left the impression that ice had gouged a channel to that depth.

Winter Quarters.

Early in the morning of August 28, just one month after leaving Quebec, the *Arctic* lay to off Winter harbour; and after some soundings had been made and buoys placed to mark the entrance, the ship was moved inside the harbour to the position she was to occupy for over eleven months. The site of Captain Sabine's observatory was easily located from the measurements—1,800 feet west and 1,200 feet north of the point on the west side of the harbour—given in Parry's Journal. This point is formed by the delta of a stream which, after flowing east for several miles, turns abruptly south and discharges into the harbour. After a lapse of nearly ninety years, this same point on the west bank of the ravine, was occupied by Mr. Jackson for another series of magnetic observations. The site of the pendulum observations, and the grave of one of the *Hecla's* seamen, were found near the northeast side of the delta. The soil, which was composed of sand and clay, seemed much more productive than that farther east. A few plants were still in flower and the last of the season were collected. Traces of the land animals of the region were to be seen on every hand; a flock of snowy geese were preparing for the long journey

southward; flocks of ducks were quite numerous in the shore waters, and jaegers, Lapland longspurs, and snowbirds on land.

This harbour, which was discovered by Parry in 1819, is about two miles long and one mile wide. The depth inside the point mentioned above is from 3 to 4 fathoms; while that outside is about 8 fathoms. A bar projecting southwest from the point on the east side of the harbour makes it fairly secure even from the southeast winds. The surrounding land has nowhere any considerable elevation. Northeast hill, Northwest hill, and West hill, at distances of 2 miles from the shore, have elevations of 190 feet, 250 feet, and 300 feet, respectively; while from the latter, the land slopes gradually to the sea at Hearne point, 5 miles to the south. Table hill, 8 miles distant in a north-northwest direction, has an elevation of 600 feet. Though having the appearance from Winter harbour of a table hill this is in reality a group of three somewhat rounded hills which rise from 200 to 300 feet above the general level of the plain. The surface generally is formed of clay mixed with more or less sand and fragments of sandstone; it is quite stony in places where running water has washed away much of the finer material, and is formed mostly of shingle along the lines of outcrop of the sandstone. About undrained ponds, near the heads of ravines, some deposits of peat, 1 to 3 feet in depth, are to be found.

On the last day of August, a trip was made in the launch to Dealy island, 35 miles east of Winter harbour. This was the winter quarters of H.M. ships *Resolute* and *Intrepid* in 1852-3. On the south side of the island in a house built with stone walls 3 to 4 feet thick and 7 to 10 feet high, lie the stores left by Captain Kellett to provide against disaster to the crew of the *Enterprise*, should they be forced to abandon their ship on the northern shore of the continent. These include casks of flour, peas, potatoes, sugar, tea, rum, and clothing, and boxes of ammunition, books, and so forth, within the house, and three tanks of bread and cans of pork, mutton and carrots so placed as to form one end of the building. A can of pork when opened seemed to be still fit for food, and the woollen clothing was in as good condition as when left there fifty-five years ago. Felt and leather boots were damaged to some extent, due apparently

to leakage into the casks. The roof which had likely been of canvas supported by boards had long since been blown away. A boat which had been left behind when the ice suddenly broke up on August 18, 1853, lay on the beach near by. A wheelbarrow lay outside the house, and various tools, two muskets, a portable cooking stove and a supply of coal had been carefully placed inside.

The beach on the south side of Dealy island is formed in part of a soft grey sandstone, with a strike east by south and a dip of 45° south. No other rock was seen exposed upon the island, but on the western side of the entrance to Bridport inlet in a bluff about 400 feet high, the rock was seen to have a dip to the north. The peninsula which in part closes Bridport inlet is a continuation, with about half the height, of the ridge which forms this bluff.

On September 1, another trip was made in the launch to westward of Hearne point, and a herd of sixteen musk oxen, comprising seven bulls, six cows and three calves, was secured. This ended the navigation for the season, and the ship was frozen in on September 15.

The first week of September was taken up in securing the musk oxen and in the examination of the vicinity of the harbour. Coal was reported by the Captain and Mr. Jackson as occurring on the point—known as Reef point—on the east side of the harbour. This proved on examination to be a layer of smut or disintegrated coal about 1 inch thick, with three or four inches of a mixture of this material and sand underneath. This material forms the surface underneath the ice or shallow ponds which extend for several hundred feet along the shore on the southeast side of the point, and rests upon a layer of sandy clay. The beach is strewn with considerable matted seaweed; and the surface of a terrace a few feet higher up is covered with a thin dark layer of vegetable origin, formed most likely from fresh-water algae. No coal other than some very small fragments were seen anywhere in the locality, but pieces of oil shale, varying in size from that of the hand to 2 inches thick, to small fragments, were scattered about farther up on the point. No further evidence of an outcrop was seen, and it could not be determined whether this layer represents

a thin deposit of itself, or the waste coal seam or layer of bituminous shale in the sandstone. The frozen nature of the ground makes any extensive excavating impossible except, at great expense.

On September 16, the ice being strong enough to bear our weight, a party of four went to Table hill, secured the record left in a cairn upon the summit by Parry in 1820, and deposited Captain Bernier's record in its place. Several herds of reindeer were seen, aggregating possibly two or three hundred, and two secured out of a herd of fifteen. As soon as the deer were shot, two wolves made their appearance, and finally secured the lion's share for themselves.

Outcrops of sandstone and shale were examined in the side of the ravine 2 or 3 miles west of the harbour. These beds bear every evidence of being shallow-water deposits. Cross-bedding is exhibited in a bluish-grey sandstone at the nearest point, the dip varying from 0° to 30° south. Above this for 25 feet thin layers of similar sandstone alternate with layers of shale. Half a mile west of this a loosely cemented grey sandstone, containing carbonized plant remains and seams of coal a fraction of an inch thick, overlies the latter bed. Ripple marks are quite abundant in places and at the farthest point mud pebbles occur in a bluish-grey sandstone with a dip of 2° to 3° west. The strike is not very definitely shown, but is in a general east and west direction. No recognizable fossil remains were seen in these beds.

The rock exposed in the vicinity of Winter harbour consists for the most part of greyish-white sandstone in nearly horizontal strata. On Fife point, 3 miles east of the harbour, this rock has its maximum dip, that of 30° south-southwest; and about 3 miles northeast of this point in a ridge about 200 feet in height, running in a west-northwest direction from Wakeham point—6 miles east of the harbour—planes of fracture are exhibited with an inclination of 70° south-southwest. Fully 6 miles to the westward in the same line of strike, but on the opposite side of a nearly parallel ravine, similar planes of cleavage were noticed in the same kind of sandstone at an angle of 65 or 70 degrees. In the ravine half a mile to the south, planes of fracture were noted at an angle of 65° , in a cross-

bedded sandstone with layers dipping from 10° south to 10° north. Some 2 miles down this ravine at a point 5 miles north-northwest of the harbour, 30 feet of this sandstone containing minute rusty particles is exposed in the bank with a slight dip to the south. Four miles farther down at a point northeast of the harbour, also in the south side of the ravine, there is about 15 feet of a dark grey sandstone with thin shaly layers in horizontal strata. These outcrops are at elevations of approximately 225, 70 to 100, and 20 feet respectively.

In order to extend the range of travel, a camp was moved 10 miles north of the ship for the last ten days of September, and the country within a radius of 10 to 15 miles examined in some detail. An assistant was provided, but most of his time was occupied with a struggle with a deranged 'Primus' stove and watered kerosene. Finally a supply of wood alcohol and a suitable stove were obtained, and no further difficulty was had in cooking our food. Two men were also provided for the purpose of securing game, and by the joint efforts of the party some two dozen reindeer and half a dozen musk oxen were secured. These together with a like number obtained in the vicinity of the harbour, provided an abundant supply of fresh meat for the winter. The sleighing at this period could not be considered good, but was probably not greatly inferior to what is encountered on the land during any part of the winter previous to the month of May, for the high northerly winds sweep all exposed parts and pile up the snow in ravines. As a result, fully one-half of the ground remains practically bare during the winter, and only with the advent of milder weather in May is there anything approaching a complete covering of snow.

From Cape Bounty a ridge of hills, about 500 feet in elevation, extends in a north-northwest direction to a point 15 miles north of Winter harbour. When the summit of this escarpment is attained, the land to the northward is seen to retain approximately this elevation, while to the westward is a level plain fully 200 feet lower. Outcrops of sandstone were seen at several points along the southern side of this elevated block. In the side of a ravine emptying into the bay west of Cape Bounty, thinly laminated sandstone and shale outcrop in hori-

zontal layers or possibly with a slight dip to the south. About 2 miles south of the middle of the ridge, on minor hills alongside of a ravine which follows the course of the ridge, several small outcrops of a very rusty sandstone, dipping slightly to the south, were examined. From the reddish colour of the ground at this elevation, there appears to be a bed of this sandstone extending practically the length of the ridge. In a ravine which discharges on to the plain from the west end of the ridge, about 40 feet of white sandstone is underlain by 10 feet of shaly strata in which occur, at intervals of 2 feet, firm bands of dark, reddish-weathering sandstone, 1 to 2 inches in thickness, with a dip of 5° south. About 2 miles south-southeast, 20 feet of similar white sandstone outcrops in a similar ravine.

At the end of August, the ice of the fresh-water ponds already had a thickness of nearly 2 inches. On the salt water, ice commenced to form in the shelter of Winter harbour on September 10, and by the 13th had closed in around the ship. Two days later it had a thickness of from 4 to 5 inches, and was of sufficient strength to bear a man's weight. The ice first formed is soft and porous, and readily gives way under any concentrated load, such as a boat supported on its keel. On September 23, the thickness of the sea ice was 8 inches, and that of fresh-water ice, 1 foot. After this date no lakes were seen which were not frozen to the bottom. The accompanying table gives the thickness of ice in Winter harbour throughout the winter. During the first week in October, little ice was to be seen in the sound. The shore ice extended at this time in a curved line from Cape Hearne—5 miles out from the harbour—to Cape Bounty. On the 8th this was bordered by a mile of thin new ice. This last mile had become firm by the 16th, when a mile of open water separated it from heavy floe ice which closed the view to the south. Eleven days later open water could still be seen from the hills about the harbour. On November 6, the solid ice extended to a distance of 7 miles from the harbour or 2 miles beyond the point. Two pressure ridges, 10 feet in height, in the last half mile, indicated where masses of heavy floating ice had been driven by the wind against the edge of the shore ice. Outside of this shore belt rafted ice alternated with newly-formed ice 1 or 2 inches in thickness.

As a further indication of the time of consolidation of the ice in Melville sound, the *Resolute* and *Intrepid*, which left Dealy island on August 18, 1853, when a strong north wind broke up the ice, were stopped within twenty-four hours by the pack in Byam Martin channel, drifted about over two months, and only became stationary on November 12, in longitude 101° west, 20 miles off Cape Cockburn. The ships made westing on two occasions only, showing that there is a permanent, easterly current towards Barrow strait.

Date.		Thickness of ice in inches.
September	15.....	4 to 5
"	26.....	9
October	3.....	12
"	12.....	15
"	23.....	18
"	26.....	21
November	2.....	22
"	7.....	24
"	14.....	28
"	21.....	31
"	28.....	33
December	5.....	34
"	12.....	43
"	19.....	44
"	26.....	45
January	2.....	51
"	16.....	60
February	20.....	74
"	27.....	79
March	6.....	80
"	16.....	80
"	27.....	82½

According to Mr. Braithwaite, mate, to whom some of these measurements are due, the thickness to 8 feet during April, was practically constant during May, and had lessened to 91 inches by June 5.

Ice for water supply was obtained from what are commonly called 'bergs,' though it is doubtful if any of them were formed upon land. These are masses of ice, aground along the shore, which project from 5 to 30 feet above the surface of the sea. It seems more probable that they have been formed by the rafting and tilting of floe ice, than that they have been drifted from regions to the north and east where glaciers discharge into the sea. The clear blue portion of these masses produces a fairly pure drinking water. The water obtained later by melting snow, was less palatable but also less salt.

The sun was seen on November 7 for the last time until early in the following February. Beautiful purple hues tinted

the northern sky on some of the last days of its appearance. After the disappearance of the sun the aurora borealis was occasionally seen. These phenomena which in these high northern latitudes appear in the southern sky, though perhaps more frequently seen on account of the extended nights, are not more brilliant than those seen in middle latitudes.

December proved to be the coldest month of the winter, and the Christmas week, with a minimum temperature of 56° below zero, the coldest portion of the month. The average temperature for the month of January was 30.8° , and for the month of February, 29.3° . April as a whole was colder than March, the minimum temperature in each of these months being about the average temperature of the three previous months.

Spring Explorations.

In order not to lose this season when the temperature permits of making observations and the snow is firm enough for easy travelling on land, I requisitioned for and obtained a man to accompany Mr. Jackson and myself, together with the necessary supplies and equipment for a two weeks' trip in the district east of our winter quarters, and similar supplies which would allow me to accompany a supporting party to the westward at a later date.

On March 2 our party, consisting of the two scientific observers and James Brace, an experienced Newfoundland seaman, upwards of seventy years of age, left the ship with a small sled, and camped on the ice, 14 miles east of the harbour. After two days spent in examining the land adjoining, the outfit was moved to Cape Bounty, and camp made in a dugout in a snow bank. As our plans were to camp for several days in one place, in order that Mr. Jackson might secure complete magnetic observations, and the territory within reach be examined by myself, it was thought advisable to do without a tent and spend the half dozen hours necessary to dig out a living space in the firm banks of snow on the steeper hillsides facing the south. This was found to be the more comfortable way of living with the temperature ranging from zero into the thirties below. The third camp was made at the bluff headland 2 miles

west of Bridport inlet, and the fourth on Dealy island. From the points the land to a distance of 10 miles inland, and as far east as Skene bay, was examined in some detail.

The rocks exposed around Cape Bounty are, with one exception, the ordinary soft friable sandstones of Melville island, and interbedded shales. This exception is on the small islands east of the cape, where a quartzite or very quartzose sandstone outcrops as a ridge on the north island, and as a cliff 50 feet in height on the south island. The appearance of this rock would indicate that it was of greater age than the other rocks in the vicinity. On the south island, the strike is easterly and the dip 10° north, and the relation to rock outcrops on the mainland is not apparent. The ridge on the north island appears to be a continuation in an east 10° south direction, which is that of the present magnetic meridian, of beds of more or less quartzose sandstone which outcrop at various places on the mainland for a distance of several miles. The dip of the rock on the island is 20° north, while that of the white sandstone on the shore of the mainland is 0° - 15° north. The rock reaches an elevation of 45 feet on the island, and of 150 feet within a short distance of the shore on the mainland. One mile from the shore at an elevation of 315 feet, rock almost as quartzose as that on the island outcrops with a strike east 15° south and a dip of 10° - 15° north. On the opposite side of a valley 2 miles to the west the strike observed was east 5° south. One mile farther in the bottom of a ravine at an approximate elevation of 100 feet, the quartzose sandstone is underlain by cross-bedded, soft, crumbling, white sandstone, seen in many places on Melville island. One mile to the westward at an elevation of 500 feet, hard white sandstone, some layers of which show ripple marks, is exposed with a strike east 20° south and a dip of 10° north. This has two well-marked systems of joints, one at right angles to the dip, the other to the strike. A mile and a half west of this, near the head of the western branch of the same ravine, there are several small outcrops of sandstone with a dip of 15° - 20° north, at elevations varying from 250 feet to 550 feet. The hills forming the ridge to the northwest are, to a great extent, covered with sandstone shingle. Three and a half miles southeast of the last outcrops, and one mile south of

the junction of the two branches of the ravine, beds of shale are exposed by erosion at an elevation of 100 to 125 feet, which have a dip of 15° - 20° north, and strike east and west. These contain siliceous particles and bands, and resemble a gneiss in the process of making. The relationship of the quartzose sandstone and these underlying beds would seem to show that it is a particularly hard bed in the series, rather than a rock of greater age.

The Cape is formed of two hills rather less than 500 feet in elevation, separated from those to the north by a gap, which runs for 4 miles in a direction east 10° north right across the headland, and from each other by a valley 300 feet deep. On the summit of the west hill where the strike of the rocks was obtained, it corresponded with the direction of the gap, and with the direction of the two hills. These comprise sandstone in layers 2 to 3 inches thick dipping 15° to 20° south, and thin shaly layers, some of which are iron-stained. The summit of the east hill is surrounded by a cairn, and on its north and east slopes some sandstone is exposed. That on the north side is rusty and quartzose, with a dip of 5° south. At an elevation of 545 feet on the hill north of the western end of the gap, siliceous shale, showing irregular ripple marks, has a dip of 5° south. Four or five miles from this in a west-northwest direction on the east side of the hills, 700 feet in elevation, which form a part of the ridge overlooking the sea, several small outcrops of sandstone have a dip of 20° to 25° south-southwest. Only in one place was the sandstone in layers less than 2 inches thick, and there it was reddish in colour and more shaly in character.

Between 7 and 8 miles north of Cape Bounty the plain is intersected by a ravine running towards the east in which rock outcrops in the south bank. At an elevation of 340 feet on the top of a 70-foot bank the sandstone has a dip of 10° north. About a mile and a half east of this, soft, crumbling, grey sandstone in irregular beds has a dip of about 5° north in a bank 100 feet high. Half a mile farther east, where the ravine, after being joined by a branch from the north, turns in a south-east direction, there are two small outcrops of similar sandstone dipping to the south at an approximate elevation of 100 feet.

From 10 to 11 miles north of the cape, a ridge three to four hundred feet above the plain extends eastward to the headland near Bridport inlet, and is continued in Dealy island. This ridge is intersected by several deep ravines discharging on to the plain, which from an elevation of over 400 feet slopes gradually down to the sea. In one of these, north of Cape Bounty, the sandstone shows a dip of about 50° south. At this point the ridge has an elevation of 760 feet, and the country to the north again presents the character of a stony plain. Two miles east in the sides of a smaller ravine, the same grey sandstone outcrops with a dip of 50° south; and about 4 miles east in the bottom of a large ravine at an elevation of 365 feet, the rock has the same dip. Nearly 5 miles east another large ravine discharges on to the plain at an elevation of 325 feet, and flows to the southeast. In the mouth of this ravine the strata, some of which are cross-bedded, dip from 35° to 60° south-southwest. About 2 miles east of the last, sandstone outcrops with a dip of 10° north in a ravine 1 mile north of the ridge which was reached from Bridport inlet. On both sides of the next ravine, 2 miles east, about 100 feet of white sandstone in layers 1 to 2 inches thick has a dip of 10° - 15° south, and a strike of east 15° south at an elevation for the top layers of 480 feet. The highest parts of the ridge in the next 2 miles have elevations of 525, 500 and 475 feet respectively. Grey sandstone on the face of the last hill has a dip of 15° - 20° south. In the next mile to the bluff where the ridge meets the sea, a considerable thickness of strata is exposed. In a depression at an elevation of 330 feet, shale with red layers dips 5° south. In the last of the series of ravines at an elevation of about 200 feet, very siliceous shaly strata has a dip of 20° south. Fifty feet below this, 100 feet of shale which dips 5° south has been cut through. Some layers of this contain sufficient ironstone to be firmly cemented, and red in colour. In the bluff, which is 2 miles from Bridport inlet, a section of 450 feet is exposed in the ravine, but with a dip of 10° - 15° north. The top of the cliff is formed of beds of white sandstone, having the same dip, which are continued on the point at a much lower elevation.

The first 2 miles north of this bluff retain an elevation of 500 feet. In the third mile the land drops to 320 feet, then rises in a second ridge to 370 feet. This ridge is continued

eastward to the shore, where a bed of sandstone striking east 15° south has a dip of 20° north, then in a small island and in the peninsula which partially closes Bridport inlet. At the end of the fourth mile a ravine flows east into the bay. In the bottom at an elevation of 100 feet, thin-bedded grey sandstone has a dip of 20° north. One mile farther, a sandstone pillar 4 feet by 3 feet projects, at an angle of 60° , to a height of 7 feet from the ground, which has here an elevation of 350 feet; at the end of another mile a ravine 150 feet deep intersects the plain. In the next 2 miles the elevation increases to 435 feet, and at a distance of 8 miles from the sea, in a direction 5° west of true north, a deep ravine in the next ridge is joined by a channel which parallels the foot of the ridge. At an elevation of 400 feet, in the first bench 50 feet above the forks, shaly grey sandstone dips 30° - 35° south. From an elevation of 500 feet in the sides of the ravine, to the top of the ridge at 800 feet elevation, hard white sandstone with about half this dip is exposed. From the crest the hills on the east side of Bridport inlet bear east 25° south. To the north the land stretches away in a plain the highest parts of which are covered with sandstone shingle; but through the gap in the ridge at the head of the inlet, another similar ridge could be seen to the northward. At 1 mile east a ravine nearly 100 feet deep was crossed, and at 3 miles a descent was made to the bottom of a ravine only 300 feet above the sea. Shale in thin layers was here exposed, with a strike east 25° south. The dip varies from 50° to 75° and upwards, and would average about 65° south. In the mile between this point and the embouchure, the section of strata exposed was the most extensive seen on the island. It included:—

1,000 or more feet of shale with an average dip of 65° south.

225 feet of shale with sandstone layers with an average dip of 65° south.

1,400 feet of white sandstone with a dip of 70° - 75° south.

280 feet of crumbling white sandstone with a dip of 70° - 75° south.

940 feet of firm white sandstone with a dip of 70° - 75° south.

The ridge of sandstone which forms the peninsula in Bridport inlet is continued, with an average elevation of 200 feet, in an east 15° south direction as far as Palmer point in Skene bay, the greatest elevation—235 feet—being at 4 miles from the eastern end. Broken sandstone extends the entire distance of nearly 20 miles. At 3 miles east of Bridport inlet the dip is 5° - 10° north, and at 2 miles west of Skene bay it is 0° - 5° north. Between this ridge and the one running from the north side of Bridport inlet to the entrance of Beverley inlet the land is a comparatively flat plain. A continuous valley or depression separates it from hills to the south which have nearly the same elevation in its central part. Pieces of clay ironstone are quite abundant on the surface of the ground. The drift materials comprise pieces of limestone, gneiss, graphitic granite and a very dry basic greenstone.

The securing of a supply of venison enabled us to remain out for some days over the two weeks, and a delay of four days at Cape Bounty during a blizzard caused some anxiety on board the ship. Half way in on our last journey, we were met by Mr. Green's party, who had returned a week before on account of some members of the party being frost-bitten, when 12 miles off Cape Providence.

As Mr. Green's party were about to make a second start for Bay of Mercy in Banks island, arrangements were made to accompany them as far as Cape Providence, where some time could be spent in an examination of the locality, with the depot as a base. The party, consisting of nine men and the only remaining dog, left the ship on May 1, and reached the depot, 4 miles off Cape Providence, five days later. The majority of Morin's party were met on the 5th on their way to the ship, and two days later Messrs. Morin, Chasse and Pike arrived in an exhausted condition. Both parties left the next day, the three men for Winter harbour, and the other seven for the *Investigator's* winter quarters, one man being left behind at the depot. After an interval of twelve days a large force arrived from the ship. Six men were to haul back the boat and extra supplies, two were remaining at the depot, and four under Morin were following Green to Bay of Mercy. As in the interval the examination of this section had been completed,

the return was made with the party going to the ship. As on the way out, half the time was taken up in the drag-rope, and half in searching the first few miles on shore for outcrops of rock, in this way completing the examination of the southern part of the peninsula.

Eastward of Cape Clarendon the land is comparatively low, and no rock was seen in place. A ridge 300 fet high running in a north 50° east direction a few miles inland from Cape Phipps, may possibly indicate the strike of the sandstone. On the flat point 7 miles east of Cape Clarendon, the drift consisted of pieces of scoriaceous tuff, granite, gneiss, and dark greenstone. Pieces of coal were found both here and at Cape Providence. At intermediate points boulders of hard diorite and of diabase were seen.

Observations at Cape Clarendon.

A ravine discharges into the sea on the east side of Cape Clarendon, where the land near the shore has an elevation of 200 feet, and exposes some of the strata. Shale and grey sandstone containing pebbles of clay ironstone in horizontal layers are the lowest of these. At an elevation of 100 feet white sandstone dips 5° - 15° southwest. Near the forks, 4 miles to the northwest, the ravine cuts through crumbling yellowish-white sandstone, which dips at various angles to the south. Some layers of this contain fragments of carbonized plant remains. Similar rock was seen in a ravine 3 miles to the west at a distance of 1 mile from the sea, and at an elevation of 150 feet on a nearby hill.

Travelling in a northwest direction from Cape Clarendon at a distance of 7 miles from the cape a ravine flowing to the southwest was crossed. Grey shale containing pebbles of clay ironstone has a dip of 0° - 8° north, at an elevation of 140 feet, and on the farther side at 80 feet higher level similar rock has a dip of 0° - 10° northeast. At a distance of 8 miles ravines from the north and northwest join one another at a much higher elevation, and at 10 miles the elevation of 900 feet is reached on a hill, to the west and north of which are other rounded hills still higher. The valley 1 mile west has an elevation of 790 feet. Three miles southwest of this valley the

bottom of a ravine 300 feet deep was reached at an elevation of 575 feet. The lower part is cut through shale and at an elevation of 710 feet in the sides thin-bedded grey sandstone outcrops in horizontal layers. Branches from the west and northwest join and take a course east and southeast. Three shallower ravines flowing in the same direction were met with at intervals of approximately 1 mile, and the course was then changed to south-southeast. At the end of 5 miles a descent of 400 feet was made into the forks of two ravines at an elevation of 200 feet. Sandstone dips 5° east at the top of the cliff, and at various points on the sides. Half a mile lower down this ravine is joined by a large one from the west at an elevation of 140 feet, and 3 miles in a southeast direction, after being joined by a northeast branch, the ravine discharges into the sea at a point 7 miles east of Cape Providence. In the side of this latter branch at a mile and a half east of the junction, and the same distance north of the sea, firm white sandstone outcrops at an elevation of 350 feet, with a dip of 10° south. Half a mile west of the junction, horizontal layers of shale in a crumbling condition are exposed in the bottom of the ravine at an elevation of 150 feet. These contain fossils of a small *Brachio-*pod, resembling a *Lingula*, and a minute layer of very brittle coal, quite unlike the coal found as loose pieces in so many places on the island, which is tough and has a woody ring when struck with a hammer. A layer of grey sandstone interbedded in the shale contains coaly fragments and carbonized plant remains. One mile farther west in this ravine, shale in approximately horizontal layers, containing other fossil shells, outcrops at an elevation of 175 feet. The shale is interbedded with shaly sandstone to an elevation of 525 feet, and the whole overlain by firm yellowish-white sandstone.

The ravine which discharges from the west-northwest, 4 miles east of Cape Providence, cuts through about 700 feet of strata, some of which have been described. In a cliff, running east and west, which forms the northern bank 1 mile from the mouth, soft grey sandstone and shale alternate in horizontal layers from 250 to 500 feet elevation. At an elevation of 380 feet the shale contains concretions of sandstone, and layers of clay ironstone 1 to 2 inches thick, which thickness corresponds

with that of the largest pieces found. One of the layers of sandstone is at an elevation of 465 feet, and 15 feet lower iron-bearing layers of shale are exposed. In the next 50 feet below many pieces of clay ironstone were seen, which were filled with impressions of the same small shell previously found in the shale in the ravine 3 miles north. Two miles from the mouth on the same side a bed of sandstone, horizontal or with a slight dip to the east, forms the top of the cliff at an elevation of 700 feet. Three miles farther to the northwest in the northern branch, firm sandstone outcrops 30 feet above the bed at an elevation of 630 feet. Beyond this many outcrops of white sandstone, in nearly horizontal layers, at elevations from 700 to 800 feet, determine the level of the plain.

Four miles from the depot in a slightly more northerly direction, in the sides of a ravine which drains both east and west into the two systems of ravines just described, at an elevation of 600 feet, firm white sandstone has a dip from the horizontal to 15° east. Green carbonate of copper covers some of the faces of this sandstone. At the edge of a branch ravine in this locality, the sandstone is underlain by a layer of conglomerate composed largely of pebbles of shale cemented by layers of similar material, at an elevation of 600 feet, and this in turn by 100 feet of soft grey sandstone at from 400 to 500 feet elevation, all in nearly horizontal layers. Six miles north-northwest of the depot in the bottom of a 300-foot ravine which flows to the east, rusty white sandstone is exposed, with a dip of 10° - 15° east, at an elevation of 500 feet. Three miles north of this, in the forks of a ravine flowing southeast, cross-bedded grey sandstone with dips varying from 0° - 20° south, outcrops at an elevation of 700-750 feet. One-half mile south, similar outcrops were seen at 650 feet elevation. At a distance of 12 miles inland a hill, elongated in a northwest direction, has an elevation of 900 feet, and within 1 mile to the northward, the country is intersected by a ravine 200 feet deep.

Geology of Country about Cape Providence.

About Cape Providence, the strata exposed in the cliffs have a slight dip to the westward. Half a mile east of the cairn upon its summit, the top of a 100-foot bed of firm sandstone,

forming the lower cliff, has an elevation of 225 feet. The upper three-fifths of the cliff is of softer material—shale and soft grey sandstone—and has been worn back for several hundred feet, leaving a bench above the harder layer. At 2 miles west of the cape, firm sandstone forms the lower one-third and the upper sixth of the cliff, and softer material the part between. This lower sandstone layer apparently descends to the sea level in the next 4 miles, when the first layer of sandstone interbedded with the shale in horizontal layers, is at an elevation of 265 feet.

Beds of cross-bedded sandstone, with dips mostly between 0° and 10° south, form the upper part of the cliff from an elevation of 500 feet to the top. These are composed of crumbling white and reddish sandstone, and firmer bands yellowish-white or rusty in colour. Ravines intersect these steep cliffs at intervals of 1 to 2 miles. No headlands project from this uniformly curved shore, and it is almost impossible to locate the points which have been called capes by Parry. At a distance of 12 miles from Cape Providence, and in the vicinity of Cape Hay, an immense isolated block of sandstone in the west side of a ravine forms a conspicuous landmark. It is formed of about 60 feet of cross-bedded sandstone resting on a horizontal base of shale at an elevation of 90 feet. On the west side of a ravine 1 mile west of this point, the cliffs have an elevation of 900 feet. There are several outcrops of sandstone in the first 600 feet, and at an elevation of 610 feet a few feet of shale is interposed between 40 feet of horizontally-bedded sandstone. The top of the cliff is formed of cross-bedded sandstone. The country inland is comparatively level, with some small, rounded hills.

At a distance of 1 mile from the sea in the ravine which empties from the northwest at a point $3\frac{1}{2}$ miles west of Cape Providence, a layer of firm pinkish-white sandstone, 20 to 30 feet thick, which shows an eroded surface, outcrops with a dip of 5° east at an elevation of 105 feet. This is overlain by firm shaly grey sandstone dipping 15° northwest, which is soon followed by a similar bed containing minute horizontal layers of brittle coal. This was the first instance noted of any extensive break in the deposition of these beds. The strata under-

neath this eroded bed do not differ from those above it in appearance. At a distance of 3 miles from the sea, the succession of strata between 275 feet elevation and the top of the cliff at 800 feet is as follows: 175 feet of grey sandstone alternating with shale in horizontal beds 2 to 6 feet thick, 175 feet of crumbling white sandstone, and 175 feet of firm sandstone, both being to a great extent, cross-bedded.

The section exposed in the cliff 1 mile west of Cape Providence is as follows:—

		Elevation.
100 feet of	firm yellowish white sandstone.....	720 feet.
115 "	shale and shaly sandstone.....	620 "
5 "	rusty strata.....	505 "
140 "	shale and shaly sandstone.....	500 "
1— "	rusty strata	
140 "	shale and shaly sandstone.....	360 "
100 "	firm white sandstone.....	220 "
15 "	shale.....	120 "
10 "	grey sandstone	105 "
30 "	shale.....	95 "
15 "	cross-bedded soft grey sandstone.....	65 "
Lower 50 "	not exposed.....	50 "

During the month of May the temperature ranged about as much above zero as it had been below during April, the mean for the month being 16.9. Easterly winds were much more frequent than during any other month, and the resultant direction of the wind was now from the north-northwest, instead of from the north and north-west. Snow fell on nineteen days to a total depth of nearly one foot, which was little less than the aggregate snowfall up to that time. The percentage of cloud was greatly in excess of that for any other month, being 70 per cent. These estimates, which here and elsewhere in the report are due to the courtesy of the meteorologist, demonstrate in figures, what was apparent in the greater comfort but increased difficulty of travelling. The high winds of this season cause much less drift than when the snow is dry, and towards the end of May even the most exposed hills become covered with an inch of frost precipitated from the prevailing fogs. The depth of snow on the elevated portions of the land, varies from 6 to 12 inches, while that on the lower ground is sometimes as much as 2 feet. With the increasing temperature, this deep snow becomes sufficiently soft to make travelling on land very laborious.



Rapids running over snow in ravine on Melville Island.

The advent of spring was further marked by the return of the snowflakes on May 12. Two days before, seals were seen for the first time on the ice, and a few days later, caterpillars were seen crawling about on the ground in sheltered places. A lonely swan, on its way to the north, was the only additional life seen, previous to the end of the month.

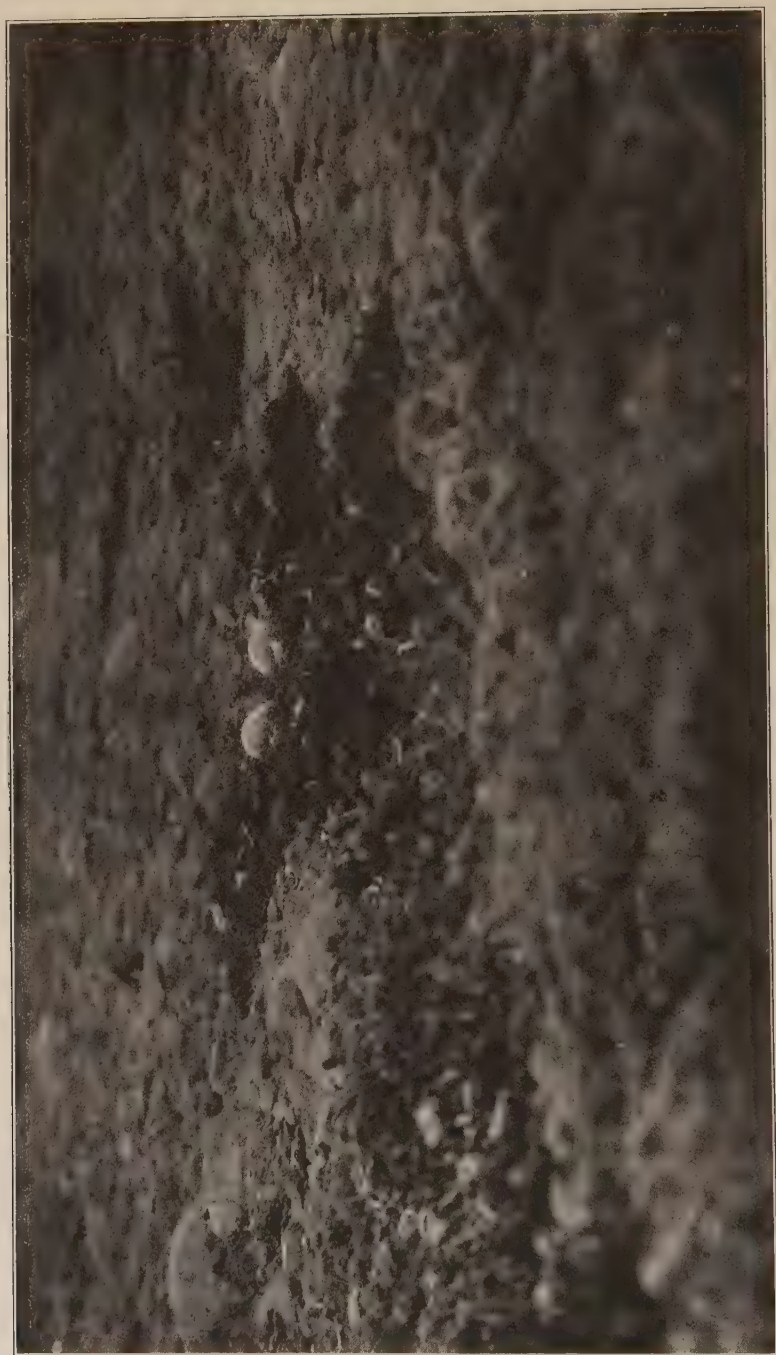
If May is the month of greatest accumulation of snow, June sees its disappearance, except where the immense banks have formed during the winter. The more exposed parts of the land are again laid bare by melting during the first week. After the first rain on the 12th, which brought the lemmings in great numbers from their holes, thawing took place rapidly; and during the last week of the month, the streams began discharging in great volume upon the shore ice.

The sled parties returned to the ship on the 11th and the 23rd; and about this time, the roof was removed from the deck, again allowing some sunlight to enter our rooms.

With the disappearance of the snow, considerable vegetation starts into growth. In moist situations, mosses grow in abundance; while in the more fertile spots, several varieties of grasses even form a fair sward. About boulders where birds of prey carry the lemmings, to feed on them or to discard them, as circumstances dictate, are favourite localities for grass and the more delicate flowering plants. The first flowers of purple Saxifrage were seen on June 22; and in this and the following month, specimens of forty different flowering plants were collected.

Observations on Shore of Liddon Gulf.

When the ground had become sufficiently dry for travelling, a man and the necessary supplies were obtained from the Commander, for a trip to the eastern shore of Liddon gulf, with the object of examining a coal seam marked on Haughton's geological map of the region. On the night of July 18, a start was made, in company with R. Pike, our outfit being carried in packs. At a distance of 11 miles in a north 10° west direction, a stream flows east at an elevation of 185 feet, and shortly takes a southerly course; and at 24 miles, a much larger stream flows west at a level between 130 and 180 feet. The intervening



Jaeger's Nest, Melville Island.



Young Owl taken on Melville Island.



Young Owl taken from the nest at Winter Harbour.

country is very level, resembling an old lake or sea bottom, and is studded with shallow lakes at a level of about 270 feet. Shale with a dip of 8° - 10° southeast is exposed, in a tributary, beneath grey sandstone. At a distance of 30 miles, Liddon gulf was approached 2 miles to the northward of Chevallier bay. Four miles to the north a river 100 yards wide was forded 1 mile up from where it discharges into a bay 2 miles in width. A ridge in an east 10° - 15° south direction, 200 feet in height, forms the northern side of this bay. For 2 miles to the north, broken sandstone covers a large part of the surface, then hills of sand form the eastern side of one of the bays at the head of the gulf. About the northern side of these bays the land is quite low.

Glacial Markings.

Glacial markings—the only ones seen upon Melville island—were found on the surface of hard white sandstone in this locality. About 1 mile north of the ridge mentioned and 1 mile from the sea, furrowed and striated sandstone outcrops in a valley with a strike corresponding to that of the ridge. At a distance of 2 miles north of the ridge, and about the same distance from the head of Liddon gulf, this sandstone has a strike east and west and a vertical dip at an elevation of 100 feet. Three systems of marks show on the surface at this point. These include striæ in a direction south 65° - 70° west or that of Liddon gulf, furrows in a direction north 70° - 80° west, and indications of grooving in a northwest direction. These indicate a movement from the east, but tell little of the extent of the ice.

Coal at Chevallier Bay.

Pieces of coal were quite numerous on the shore of the bay into which this river empties, and on the shore of Chevallier bay pieces of both coal and bituminous shale were found, but on the point north of the last, where a coal seam has been marked on the map, no trace of coal could be found. A thin layer of black vegetable material formed from fresh-water algae, which covers the low-lying ground along the beach, might possibly, when hard frozen, be taken to indicate an outcrop. The dip of the sandstone exposed on this point varies from 5°

to 10° south-southwest. The structure of Hooper island indicates a similar dip in its strata. On the northern side of Liddon gulf in cliffs 800 or 900 feet high, strata of sandstone and shale have fully as great a dip to the north.

From the east side of Chevallier bay a south-southeast course was taken for Winter harbour. A river, 50 yards wide and 3 feet deep in the shallowest part, was forded shortly after leaving the shore. At a distance of 2 miles several hills, about 50 feet above their surroundings, and with elevations of from 300 to 330 feet, are covered with sandstone shingle. The next 2 miles to the bed of a small stream flowing west at an elevation of 180 feet is mostly covered with broken sandstone. For the next 8 miles the plain has an elevation rather under 300 feet, and produces a considerable growth of grass. The divide appears to be at a height of about 330 feet. At 15 miles a stream 10 to 20 feet wide flows east at an elevation of 250 feet, between banks 50 feet in height. Both north and south of this minor streams were crossed. At 17 miles sandstone with a dip of 8° - 10° south forms the summit of a hill 350 feet in height, distant 8 miles from Winter harbour.

Upon our return to Winter harbour it was no longer possible to walk from the shore on to the ice at low tide, as a wide strip of water intervened. Pools of water covering a large part of the ice surface, and holes sunk into and through it, indicated great inequality in melting. The largest of these holes form along old cracks where seaweed was carried to the surface during the previous autumn, others represent seal holes, while many of the smaller ones form where stones have been carried to the surface in ground ice, or where dust and small stones have been blown upon the surface of the ice during the winter. In each case, the greater absorption of heat by dark surfaces leads to the more rapid decay of the ice. A too liberal covering of dirt or sediment, on the other hand, acts as a retarding influence, as evidenced where a uniformly sifted coating of ashes, placed on the ice to form a channel, preserved 2 or 3 feet of solid ice beneath it, at a time when a channel had formed naturally at some distance to one side. The enlargement and the extension of these holes during the month of July, prepares the ice for the break-up in August.

In considering the conditions along shore, it will be readily seen that where ice forms to a depth of 8 feet, all of a less thickness will have become firmly attached to the bottom as the thickness increases. The ice not so attached is free to move up and down with the tide. This leads to the formation of a series of cracks parallel to the shore-line, the last of which follows the line of 8 feet depth. When the ravines begin to discharge in the summer, immense volumes of water, heavily laden with sediment, flow over this firmly attached shore ice, and make their way through these cracks into the sea. The result is that the top is rapidly melted away, and the bottom covered by each flood tide and left bare by the ebb. The finer sediment which is carried beneath the floating ice is, on the other hand, at all times, subject to the action of the currents. The difference in conditions is manifested by a sudden deepening at this point. From time to time after the middle of July, masses of this shore ice become detached from the bottom, and floating to the surface are carried about by the wind and rapidly melted away. It is likely, however, that some portions of this ice, instead of being so removed, remain covered in the position in which they were formed, and aid in the shoaling of the shore waters. At Cape Providence ice was seen, still firmly attached to the bottom, in the latter part of August. These conditions are such as would produce sandstones, ripple-marked, cross-bedded, and scant of fossil remains, not unlike those which form so large a part of the rocks of these islands.

The Return Voyage.

Preparations were made during the latter part of July, to put the *Arctic* in readiness for sea. Several days were occupied in breaking sufficient ice to allow of the ship being turned about; and on August 2, 200 yards of ice, varying in thickness up to nearly 4 feet, was broken during the day. On the following afternoon a strong westerly wind started the ice in motion, carrying the ship with a slow but irresistible movement out of Winter harbour. By the early morning the *Arctic* had cut her way through the quarter mile of ice to the open water behind. Though the ice had moved a distance of 5 miles, it failed to clear Wakeham point, 6 miles east; and when the wind changed

to south on the 5th, the broken ice gradually moved back, and the ship was anchored in the inner harbour, where the *Hecla* and *Griper* had wintered. A strong west wind on the 8th gave the ice sufficient motion to leave the water open to Cape Bounty. Various delays led to the opportunity being lost, and it was the 12th before the *Arctic* finally left Winter harbour. Thirty-eight hours were occupied in making half as many miles through the ice, which was now broken into pans and floes by the motion imparted to it by the wind. Cape Bounty was rounded, and towards the end of the third day, an attempt was made to run into Beverley inlet. This proving unsuccessful in the face of a strong north wind, the ship steamed east and anchored in 15 fathoms, 2 miles off Little point, during Sunday and part of Monday the 16th. Two boats went ashore on the latter day, and six hours were spent in examining several outcrops of sandstone in the vicinity. This rock is generally cross-bedded, with the layers dipping in all southerly directions. The most persistent strata have a strike in a north 55° east direction, and a dip of from 5° to 25° southeast. Eastward of Skene bay, the land slopes gradually to the southeast, and the rock appears to dip in the same direction underneath the sea. The highest land in this part of Melville island is little over 300 feet in elevation.

Byam Martin channel contained much less ice than the western part of Melville sound. Large floes, however, blocked the way around the north end of Byam Martin island, and an attempt to pass the south end was similarly unsuccessful. Two boats went ashore on the 19th west of Gillman point, and an hour was spent, previous to the signal for return, without finding any trace of the coal seam marked in this vicinity on Haughton's map accompanying the geological appendix to McClintock's Narrative. The shores of the island are low and shelving, and the interior apparently less than 300 feet in elevation.

Observations on Bathurst Island.

Byam Martin channel being free of ice on the 20th, the ship steamed north beyond the 76th parallel, where heavy Arctic ice, extending from Cape Hottspur to the nearest point of Melville

island, formed a barrier to farther progress. A landing was made, next day, at the edge of the floe, on Bathurst island; and an opportunity of three hours was afforded for an examination of the locality. Sand on the beach containing many cherty particles would seem to indicate the nearness of a limestone area, but no rocks differing from the grey sandstones of Melville island were seen. The sand was stratified to a height of 30 feet above the sea. The sandstone exposed in water-courses exhibited no regularity of dip or strike. At 40 feet above the sea on the south side of the point, coarse sandstone had a dip of 15° - 20° in the magnetic meridian— 145° . Three miles northeast, towards the opposite side of the point, sandstone containing carbonized material had the same dip in a direction bearing 300° . One mile east of the first outcrop, at an elevation of 150 feet, friable white sandstone had a dip of 25° south. The general level of the country is about 300 feet, and was covered with one inch of snow. Loose pieces of coal were found at an elevation of 250 feet.

The ice across the northern part of the channel was old and heavy, floating several feet above the surface of the water. The surface was one succession of knolls, a few feet in height, separating the level spaces where pools of water had covered the surface earlier in the season. The unevenness of the surface is probably the result of the telescoping and turning on edge of pieces of ice of one year's formation. These become cemented by the next winter's frost, and the hollows filled by the drifting snow. The summer's sun forms pools of water in the hollows, and rounds the irregular masses of ice to a billowy surface, which is quite characteristic of the ancient ice. The tide at this point is not over a foot in height, and from the appearance of the ice it seems doubtful if this channel ever opens.

An uninterrupted passage was made in one day to the southeast corner of Bathurst island. At Schomberg point a syncline one mile in width has its longitudinal axis parallel to the south shore. About midway to Scoresby point a bluff headland almost duplicates Cape Bounty on Melville island. The strata near Allison creek dip from 5° to 10° in a northwest direction, and eastward to Cape Capel the land has an elevation of from 400 to 500 feet.

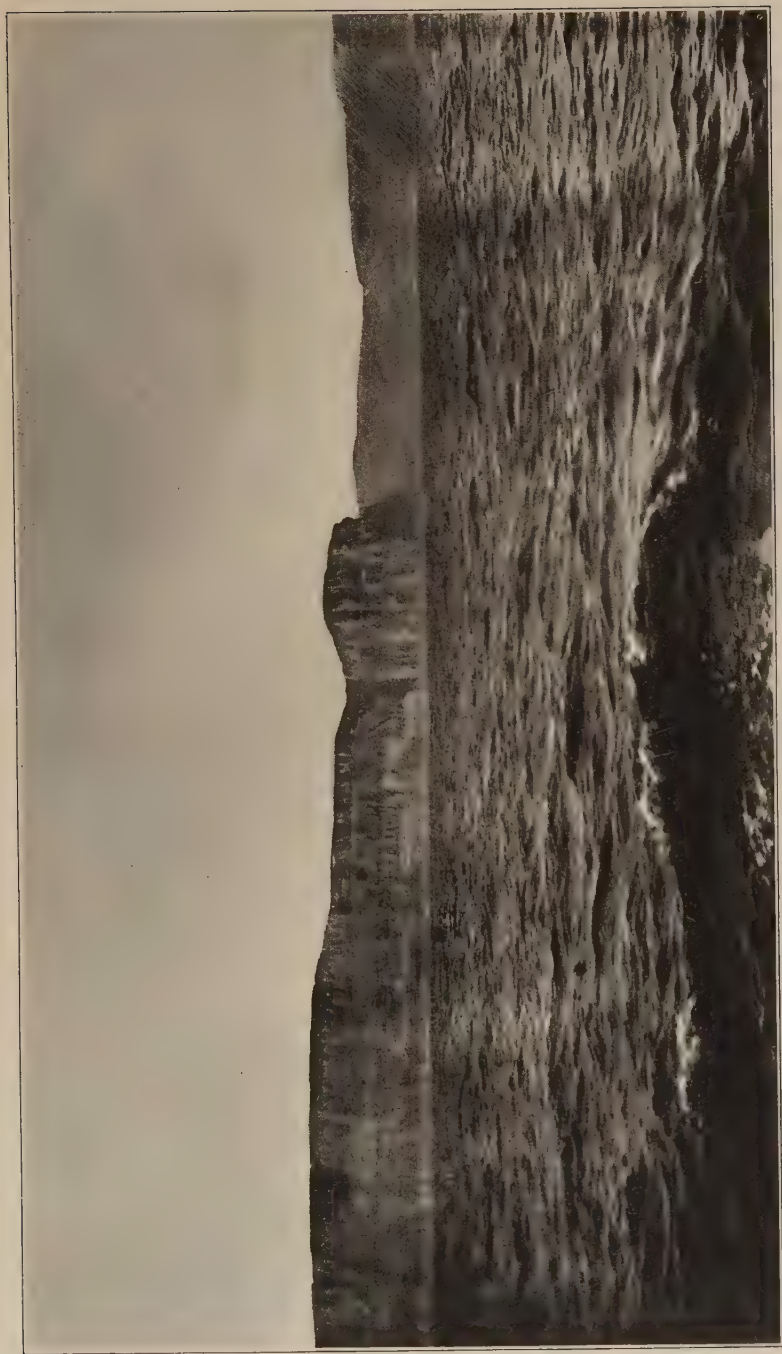
Between Moore and Baker islands ice was again encountered at noon on the 22nd, and a week was occupied in making the 80 miles through the ice in Barrow strait. Some of the floes filling the channel were 5 miles in extent. Each flood tide set the ice in motion towards the west, and often carried the ship with it for several miles.

Examination of Rocks on Browne Island.

Three hours of the 24th were available for an examination of the rocks of Browne island. Rusty-weathering limestone outcrops in the western cliff at an elevation of 60-100 feet. The strike is south 10° west and the dip 10° east. This limestone contains fossil remains of corals, &c.; and, when broken, emits a fetid odour resembling that of crude petroleum. The upper hundred feet of the cliff is formed of lighter coloured and firmer limestone with a dip of 25° - 30° east. At an elevation of 210 feet on the northeast side of the island, limestone similar to the first strikes north and south and dips 30° east. The top of the cliff has there an elevation of 280 feet, and at the south end of the island, of over 300 feet. At least twenty rather conspicuous terraces were counted in two-thirds of this height on the northeastern slope, and on the western side two were well marked at elevations of 15 and 55 feet. Pieces of clay ironstone were found on the surface of the island.

Somerville island is rather smaller, 1 to 2 miles long, and less than 100 feet in height.

The western end of Griffiths island was reached on the 26th. The ice had the appearance of a floe recently and partially broken up. Some of the pans were old, and all were thickly packed. Several carried loads of earth and stones, and one a piece of the trunk of a tree, about 20 feet in length and 15 to 20 inches in diameter. Griffiths island was passed on the 27th. The strata at Bluff point have a dip of about 10° , and this increases in 1 or 2 miles to about 30° in an east-northeast direction. At Cheyne point the same dip, east-northeast or northeast, is shown in a cliff 300 to 400 feet high. The strata are grey in colour, weathering in part to a dark red, and average several feet in thickness. Part of the coast of North Somerset was in plain view, in the evening, due to the refrac-



Cliffs of North Devon, near Stratton Creek.



Baffin Coast.

tion. Where visible, the strata had a slight dip westward. Cape Anne and the west side of Cunningham inlet appeared to be the highest parts, and Cape Rennell quite low.

Wellington channel was reached at noon on the 29th. The western side contained considerable loose ice, but the eastern side and Lancaster sound were entirely free, except for the few bergs which had drifted in from Baffin bay. The first of these, fully 100 feet in height, was aground in Union bay. The first seen on the south side of the sound was about 20 miles west of Cape Crawford.

Topography of Devon Island.

The high buttressed cliffs of the north coast of Baffin island resemble those of North Devon. Westward of Cape Crawford the strata dip is slightly to the west; and eastward of it, towards Admiralty inlet. In the cliffs east of the entrance to this inlet a flat, broken syncline is exposed. Farther east there is a change from the castellated cliffs and tableland, to a succession of rounded hills. Some of these appear to be snow-covered throughout the year. The shores of Bylot island opposite to the Wollaston islands is flat, and likely of sedimentary formation. The interior of the island is composed of lofty snow-capped peaks of granite. The hills west of Navy Board inlet are similar, and equally rugged, but not of so great elevation.

Fog obscured the view of the shores of Navy Board inlet on September 1. Several small glaciers discharge into the bay north of Low point. The western shore of Bylot island—so far as seen—appeared to be low. Glaciers occupy the mountain valleys north of Eclipse sound. The most western of these, which discharges by a stream through the low land along the shore, exhibits a fine median moraine. The others discharge direct into Eclipse sound. Some of these appear to be quite thin, while others, as the one near the narrows, have a considerable width and thickness.

The best natives of Etah were away when the *Arctic* was there, consequently I did not see the best people because they were with Peary. All writers state the Ponds inlet natives are inferior to the Etah natives.

At Ponds inlet half of the day was spent in distributing among the Eskimos some samples of the common ores and

minerals, and in endeavouring to induce them to distinguish the more valuable ores which they might discover when hunting or travelling.

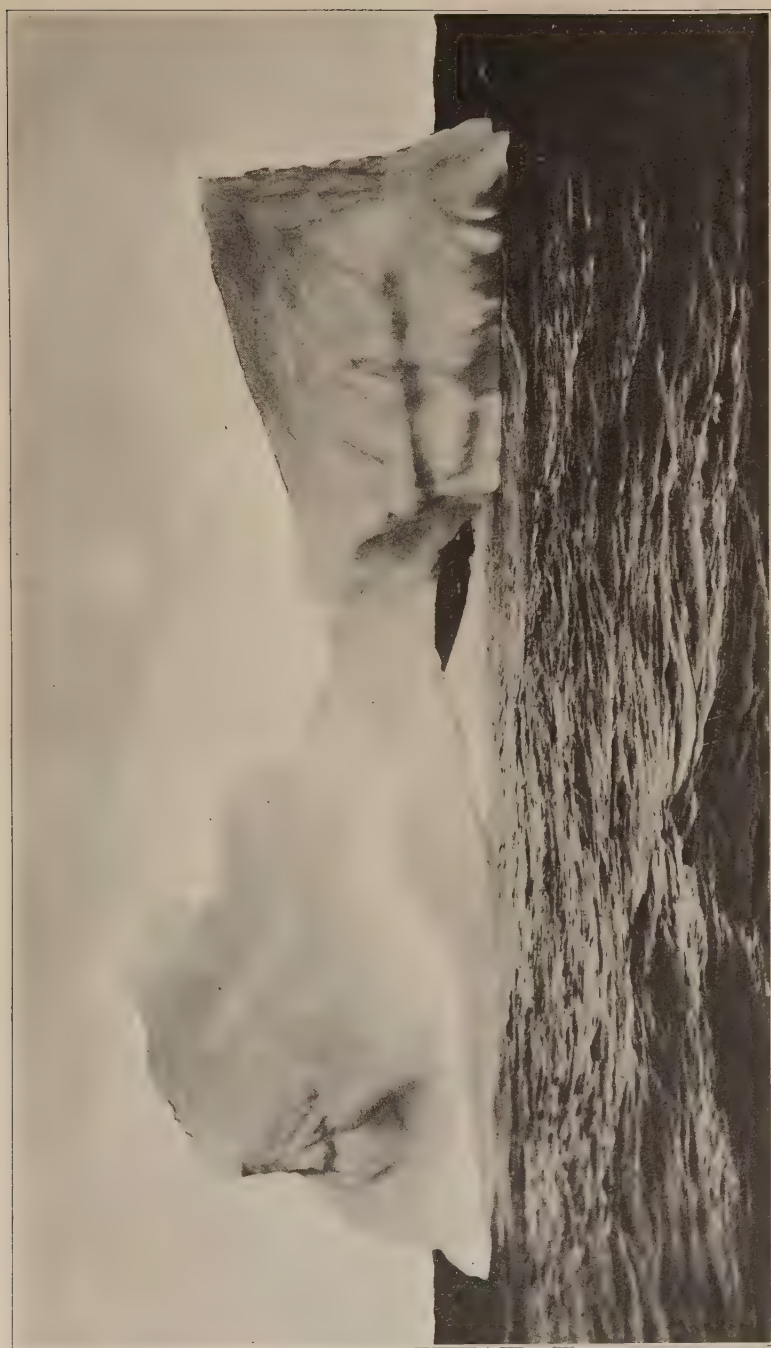
The rock about the village is typical Laurentian gneiss, mostly red in colour with dark bands. The magnetic bearing of the schistosity was 140° and the true bearing about 30° , with a dip of 45° west. Some of the hornblende gneiss in the vicinity is rich in garnets. A sample of micaceous rock, said to have come from near Igloolik, contained graphite of good quality.

Early in the morning of the 3rd, the *Arctic* proceeded down the Baffin land coast. About 10 miles from Erik harbour, a small glacier reached nearly to the water's edge. The overhanging end was fissured and apparently ready to fall. Lines of flowage were well shown on the convex surface. Several others were seen in the next 5 miles, and on the high land on the opposite side of Erik harbour. The gneiss near these glaciers is formed of wide bands of light and of dark material, much contorted in places, and in others dipping to the westward. Near Cape Weld the gneiss is very basic, nearly on edge, and very much folded. Some layers were light in colour, and a few resembled quartz veins.

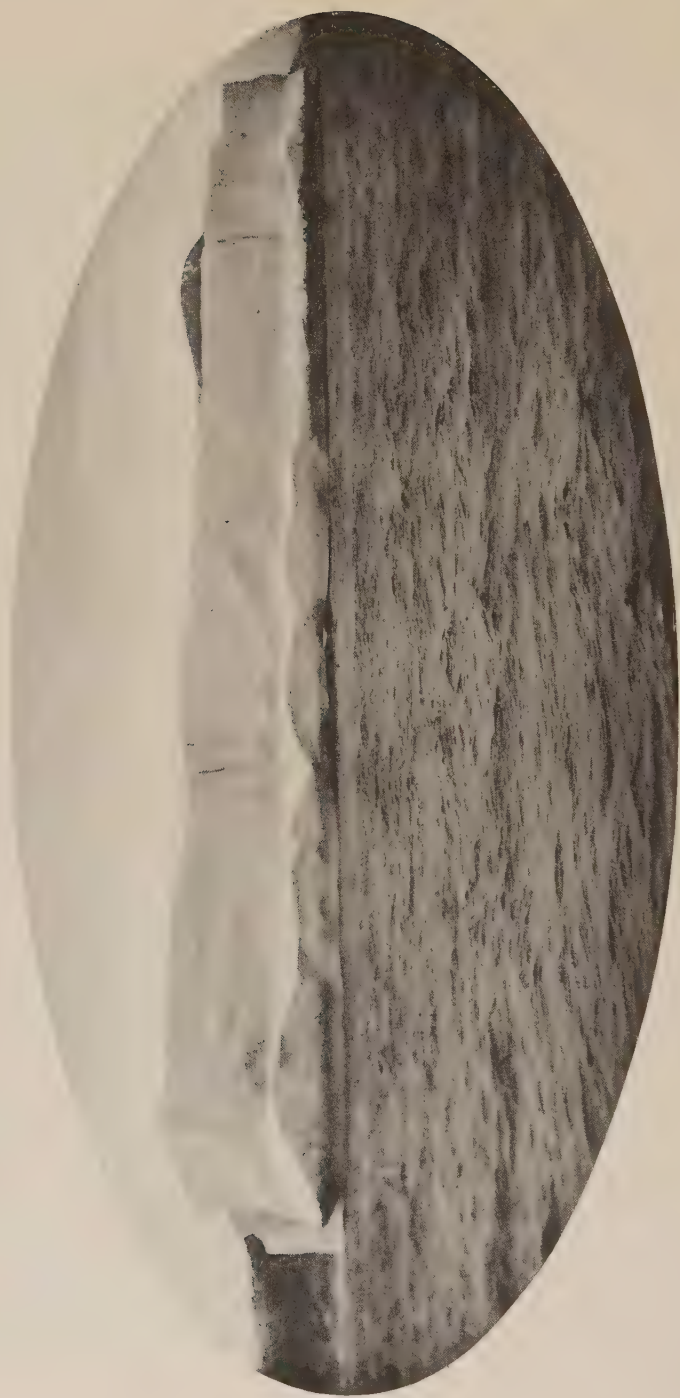
Fog and rain on the 4th prevented any view of the coast. When off Cape Adair, the summits of the Baffin island mountains could be seen in the distance. These were snow-covered except on the steep sides of their jagged peaks. The coast near Eglinton fiord could be distinctly seen during the morning of the 5th. The hills near the shore were bare and rounded, while those behind were abrupt and high with snow-covered flanks. Between Capes Eglinton and Christian a low plain formed of glacial material extends along the shore. Agnes monument is a small granite island. The range of hills parallel to the coast is interrupted by an extension of the narrow plain to the head of the bay on the north side of Clyde inlet; but hills 1,300 to 1,500 feet high form Black bluff at the entrance.

Geology of Black Bluff, Clyde Inlet.

The night of the 5th was passed in this bay in company with a small Newfoundland schooner—S. W. Bartlett, master—chartered by Mr. Whitney of New Haven. Six hours of the



Iceberg in Baffin Bay.



Iceberg off Cape Christian, Baffin Land.

morning were occupied in an examination of the hills between the bay and Black bluff, some 4 miles distant. Augén gneiss in angular blocks covers the highest summit—1,500 feet. When in place, it has a dip of 20° southwest. The direction of the schistosity is 50° magnetic in outcrops of gneiss at elevations of 1,100 to 1,200 feet on the hill overlooking the plain. The average of the readings elsewhere gives a bearing of 60° . At the sea level near Black bluff, the gneiss contains very basic bands and inclusions of amphibolite, and is intersected by small dikes of pegmatite containing crystals of biotite an inch and more in diameter. The dip is here 15° in the magnetic meridian. Nearby at an elevation of 100 feet, the bearing of the banding is 20° , and of the dip, 290° magnetic. Faults were noted, parallel to the latter direction, which is that of Clyde inlet, along which the side towards the sea had subsided, and drawing downwards the opposing edge, had formed reversed curves in the bands. These faults would indicate that Clyde inlet was due to a subsidence.

The mountains across the inner part of the inlet have an elevation of 4,000-5,000 feet, and are very rugged. The coast southeast to Cape Aston is comparatively low, but formed apparently of similar gneissic rocks.

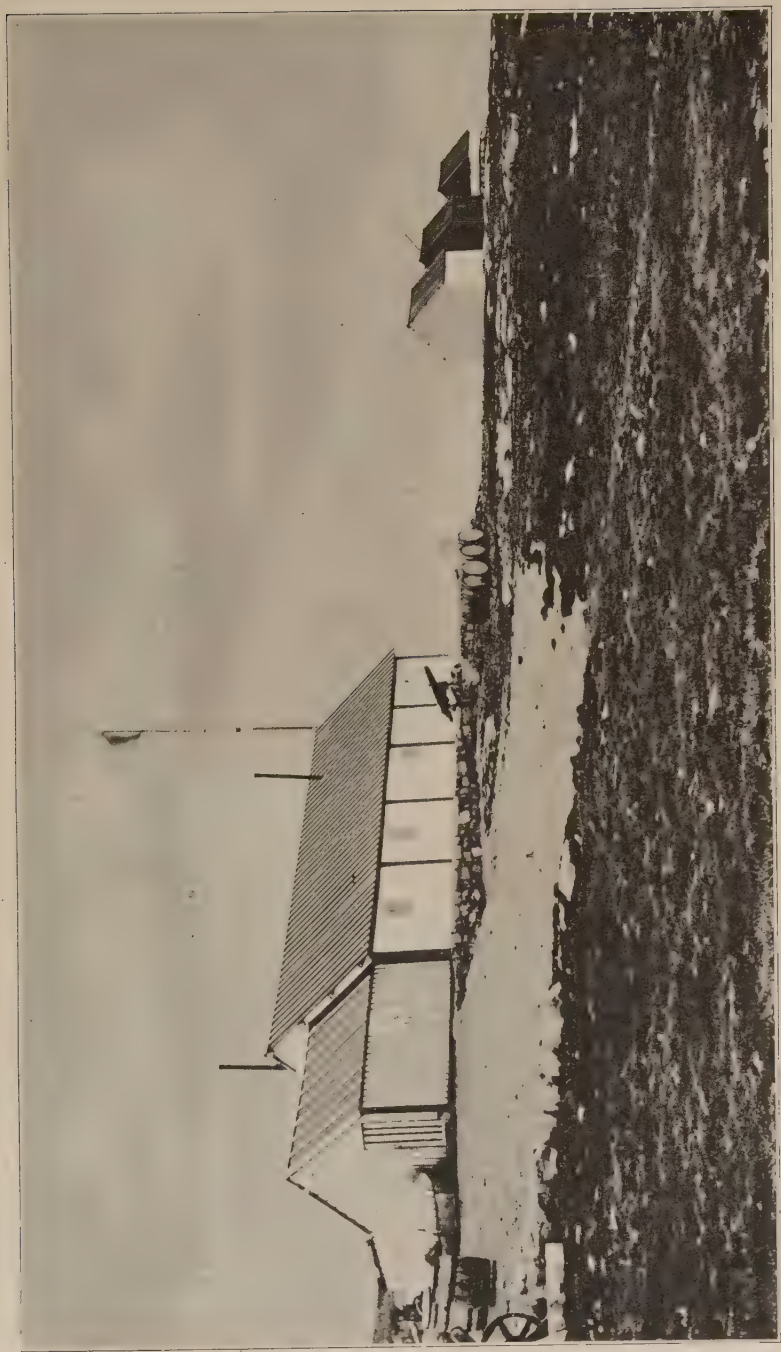
Icebergs were quite numerous from Eglinton fiord to Cape Aston. Some of these contained fissures filled with sand and ice. Off the middle of Home bay at noon of the 7th, no icebergs were in sight outside and few inside of our course. The harbour at Cape Searle had only become sufficiently free of ice to allow the whalers to enter that evening, and contained much loose ice on the following morning. Near the entrance to Cumberland gulf, pans of ice were quite numerous, especially near the shore, but few larger masses were seen. From reports of the whaling captains, it appears that this coast is fairly free of ice during September and October.

The *Arctic* was anchored on the morning of the 8th inside of Cape Searle, beside the *St. Hilda* of Southampton, a Dundee whaler under command of Captain Cooney. Part of an hour was afforded for an examination of the shore of the small island north of the harbour. The rock is a coarse volcanic breccia formed largely of amygdaloidal bombs and fragments.

About 30 feet above the sea, a layer of stratified tuff, formed of the finer fragments or ash, had a strike east and west and a dip of 35° north. The cliff was not ascended, but would be 700 to 800 feet in height. On the north end of Padloping, the rock was seen to be similarly stratified, but the dip was not ascertained. Lignite has been reported by Captain Adams at Durban island; and it would appear that these islands are formed of Tertiary rocks, similar to those of Disco on the opposite side of Davis strait.

The rock at Cape Mickleshaam and at Leopold island looks, at a distance, like gneiss. The latter headland is marked as an island on the map, but no opening could be seen separating it from the mainland. At the southeast extremity parts of the steep cliffs project as square bluffs, having flat tops dipping 10° inland. The hills of Nuvukdjuak, also flat-topped, are of moderate elevation. Milikdjuak is a high, rocky island, very bold in appearance. The mainland opposite has the same flat-topped character as farther east. North of the island, the dip of the bands in the rock is mostly from 30° to 45° north, with an anticlinal fold visible in one place. Miliakdjuin is a group of four or more islands, formed of gneiss or granite, rounded by the glacial action which has planed down the tops of the hills in this part. The mainland is here much higher, and snow-covered.

The whaling station at Kekerton was reached on the evening of the 10th. The stations here and at Blacklead—owned by Mr. Noble of Dundee—were in charge of Peter Warrender of Peterhead, and an assistant. Mr. Warrender reported a good year, having secured a small whale, about one year old, with bone three feet in length, about the usual three thousand seals, and more walrus hides than they had salt to preserve. The prices quoted for the produce were: for whalebone, £2,800 per ton; for oil, £20-22 per ton; and for narwhal horns, 15 shillings per pound. The industry is dependent upon the whalebone for its profit; even such a small whale, with bone worth only about half the quoted price, gives a fair return. The station comprises two wooden buildings, one used for storehouse and the other for office, house, and workshop, the usual



Kekerton Whaling Station.



Blacklead Whaling Station.

half-dozen 30-foot whaleboats and casks for oil neatly arranged in rows, and a motley group of Eskimo houses.

Blacklead Island.

Blacklead island was reached next morning, giving the agent an opportunity to visit the southern station. The buildings here include, besides the usual structures, the church, school, and dwelling-house of the mission under the charge of the Rev. Mr. Peck. The missionaries, who have had their headquarters here for a number of years, were absent in England.

Many of the natives were far inland securing their annual supply of deerskins, and the bare framework of their houses afforded an opportunity of examining their construction. The summer houses or tupiks have a ground plan nearly the shape of a laterally compressed hexagon. The sides nearest the door are, however, about half again as long as the others. The houses are about 15 feet in length, 10 feet in width and 7 feet high with a batter of 1 foot. A ridge pole and rafters support the roof of the front section, and single rafters of varying length, sloping from the principal rafters to the plates, that of the rear or sleeping portion of the house. In the more primitive buildings, a single rib of a whale forms the arch at either end of the hut, and smaller bones ingeniously arranged, the rest of the framework. More generally, staves from broken casks, and whatever other pieces of wood are available, are the materials used. In these, single staves serve as posts or stud-ding; and to secure the extra length for rafters or plates, two or more are spliced together and secured by nails, wire, or sinew, the convex side being always placed outwards. A covering of sealskin is tightly stretched over this framework and held down by stones around the walls. In this way a building is constructed of a shape well adapted to resist wind pressure. The space inside the house, with the exception of a rectangle 4 feet wide reaching from the door to the centre, is raised about one foot above the level of the ground outside. This space and the front of the building are generally boarded with pieces of packing boxes; and a door is made of the same material, if ships are lost in sufficient numbers to provide them with the manufactured article.

The most abundant rock on the island is a mica gneiss, some of the softer layers of which contain graphite in limited quantity. The direction of the banding is north 10° east, magnetic bearing 75° , and the dip 45° west. Samples of the commoner ores were distributed among the natives, pieces of graphite being the only mineral specimens received from them.

A good view was obtained, on the 12th, of the coast south of the 64th parallel. The dip of the gneiss was at this point towards the south, but the prevailing dip seems to be to the north at a considerable angle. Some portions of the rock surface are very rusty, while others are light in colour. It is possible that the latter may be bands of crystalline limestone, similar to those described by Dr. Bell on the south shore of Baffin island. The land about Cape Haven is formed of rounded hills of gneiss, with scarcely any soil even in the hollows. It is rugged but not high, being mostly under 1,000 feet in elevation. The hills look as if comparatively little change had taken place since they were planed off and stripped by ice action. The unevenness of the surface indicates considerable folding. Here as elsewhere to the north, the most conspicuous dips are in a northerly direction.

Icebergs were numerous off the end of the peninsulâ, and quite varied in shape. Some were of the flat-topped variety, while others towered one to two hundred feet in the air. Over one hundred were counted on the line of reefs near Monumental island; and fragments of ice were very abundant, indicating that large masses had been recently broken up.

Port Burwell.

After a day spent to leeward of the Button islands, battling against a strong southwest wind, the ship was anchored on the morning of the 15th in the outer harbour of Port Burwell. The anchorage here is safe and commodious, and is situated near the western end of McLelan strait, the entrance being from the southwest. The most northern of the missions of the Moravian Brethern to the Eskimos of Labrador, is located on a small but secure haven, connected by a narrow entrance with the outer harbour. A fine large building serves as church, and provides homes for the missionary and the agent or storekeeper,



"Arctic" anchored in Blacklead Harbour, Native in the Foreground.



Cape near Anderson Channel, South Baffin Land.

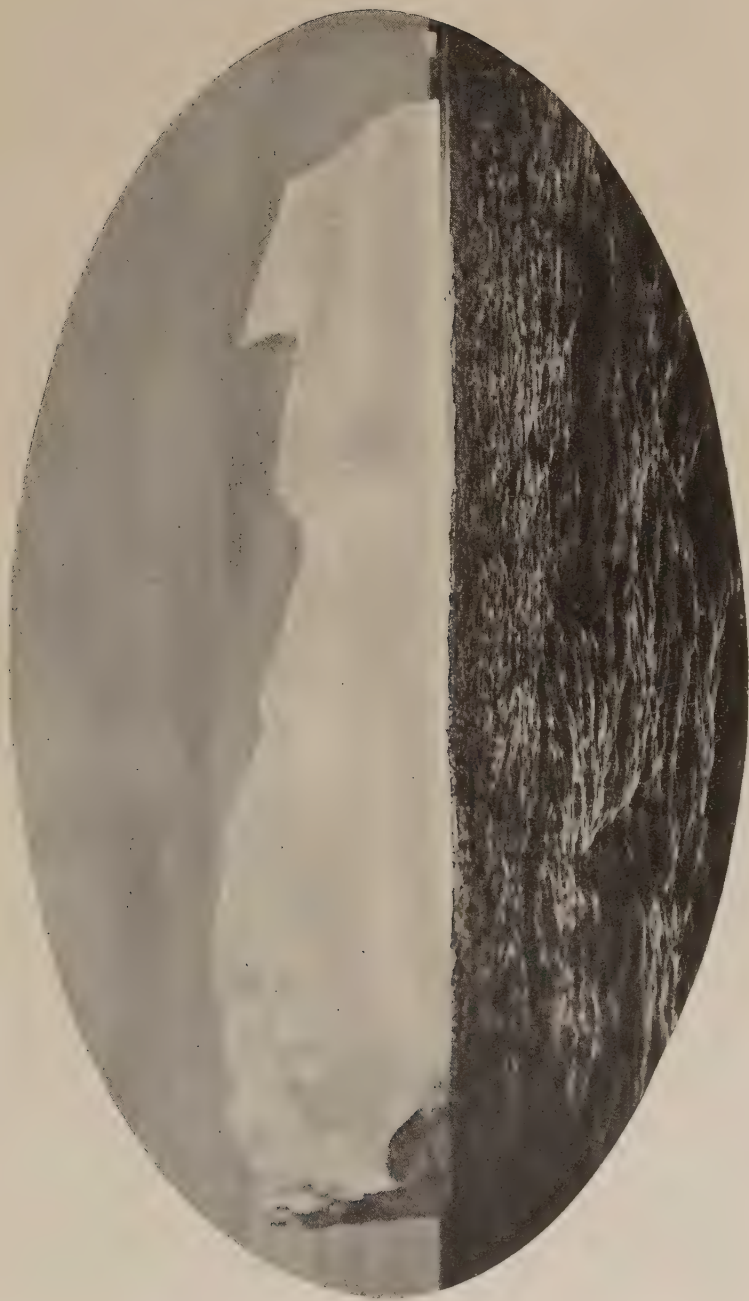
while smaller buildings serve as stores for the trade with the dozen Eskimo families living here. These missions are in large part supported by the trade carried on with the natives.

The surrounding country is a succession of rocky hills, with elevations of about 300 feet. The formation is typical Laurentian gneiss or granite, with some small bosses of greenstone. The boulders other than the country rock are of diabase, white and grey limestone, quartzite, and very siliceous iron range material. The direction of the glaciation which has produced the rounded hills seems to have been quite variable. Bearings of 65° , 105° and 145° , were all noted for the direction from which the ice had come. The first two sets of striæ were on the same surface, those with a bearing of 65° being the later. Northwest of the harbour, the chief lines of fracture had a bearing of 105° to 110° . A red granite northeast of the harbour had fractures running in a northwest and others in a northeast direction. About half a mile farther east, banding was quite distinct in the latter direction, with a dip of 70° - 75° southeast. The strike then became irregular about a boss of diabase containing inclusions of the acid rock. To the east of this boss the country rock is banded in a northwest direction. Southwest of the harbour, the rock is mostly basic grey granite or gneiss banded in a north and south direction. Near the mouth of a small fiord on the south side of the island the banding changed, through an angle of 60° to the westward, about a boss of greenstone containing dikes of felsite and pegmatite. The more acid rock is certainly the one which has its material rearranged, and would here, at once, be called a gneiss. Bearings of 90° and 115° were noted for the direction of the glaciation at this point. The glaciers would appear to have been local ones extending from the land in the direction of Ungava bay.

Late on the 18th, the course was set northwest for Big island, on the north shore of Hudson strait. Ashe inlet, the site of a former meteorological station, was reached on the 20th. The hills surrounding the inlet have elevations up to 400 feet, and are composed largely of quartzose grey gneiss containing both mica and hornblende, with some red bands a few feet in thickness. The direction of the banding is north-northwest, and the dip from 30° to 50° north.



Gneiss, Big Island, Hudson Strait.



Iceberg Outside Ashe Inlet, September, 1909.



Large iceberg aground at entrance of Ashe Inlet, Hudson Strait.

The wind blew a gale from the east-southeast for three out of the four days the ship remained in Ashe inlet; and the return voyage was commenced in the afternoon of the 24th. The Button islands were passed at midnight of the 25th; and, being favoured with fair wind, the straits of Belle Isle were reached on the morning of September 30. The course was far out to sea, and, for the most part, out of sight of the Labrador coast. The *Arctic* was reported the same evening from Point Amour. Numbers of ships now broke the monotony of boundless expanse of water; and, as the St. Lawrence was ascended, the forest-clad hills afforded a pleasant change from the bare rock and uniform grey colour of soil in the northern regions.

Messages were sent from Father Point on the evening of October 3; and Quebec was reached on the morning of the 5th, after an absence of over fourteen months.

The Arctic Archipelago.

This great archipelago extending from 60° west longitude to 141° west longitude, and from the continent of America northwards over some twenty degrees of latitude, forms the northeastern portion of the Dominion of Canada. The extent of 1,500 miles, on the west side of Baffin bay and its continuation northward into the Polar sea, is occupied by three of the largest islands and the two sounds separating them. Baffin island is over 900 miles in length, and from 150 to 500 miles in width; Ellesmere island has a length of 475 miles, and a width varying from 50 to 290 miles; while the intervening island of North Devon has a length in an east and west direction of 300 miles, and a width of about 75 miles. Between the parallels of 74° and 75° north latitude, the archipelago is divided into two parts by a channel 1,000 miles in length, extending from Baffin bay and Lancaster sound in the east, through Barrow strait and Melville sound, to McClure strait and the Beaufort sea in the west. South of the western portion of this channel are situated the third and fourth islands in size—Victoria island, 400 miles in length with an average width of 190 miles, and Banks island, 260 miles in length with an average width of 100 miles. South of Barrow strait lie Prince of Wales island, and North Somerset island which may be con-

sidered the continuation of Boothia peninsula, the extreme northern part of the continent. These rank seventh and ninth in area. The north side of this channel is formed in the east by North Devon, the fifth largest island, and in the west by the Parry islands, with Melville island, 200 miles in length, next in size. To the northeast of this group of islands, and to the west of Ellesmere island, lie the Sverdrup islands, the largest of which is the eighth island in size in the archipelago. These nine islands, together with Bathurst, Prince Patrick and Cornwallis of the Parry islands, the three next largest of the Sverdrup group, Bylot island at the southeast entrance to Lancaster sound, and King William island in the southern group, have an aggregate area of 500,000 square miles, Baffin island alone having an area of 211,000 square miles.

The whole of this immense territory—explored at great cost by the British Government—was in the early eighties given to the Dominion of Canada as a natural result of the surrender by the Hudson's Bay Company of their vast territory to the south.

Physiography.

The data relating to this feature of the Arctic islands are extremely meagre, owing chiefly to the difficulty of travel in the interior. The observations made upon the western islands by the various Franklin search parties, upon which we are to a great extent dependent for our information, were necessarily confined to the coast. The interior of the large islands of Baffin and Ellesmere likewise remain almost untravelled.

Many expeditious, since the time of Baffin, have visited portions of the coast of these islands. The observations of Dr. Franz Boas when on a research journey among the natives of Baffin bay in the years 1883 and 1884, are quoted by Suess, Vol. II, pp. 33, for this region, as follows:—

‘The narrow range which forms Cumberland peninsula runs along the west coast of Baffin bay up to Lancaster sound. In Home bay, where the coast assumes a north to south direction, a remarkable gap occurs, and the hilly country of the west advances as far as Davis strait. This range, as far as it is known to me, consists in its central part of gneiss, in the peri-

pheral parts of coarse-grained granites. The whole range, rising in steep horns and peaks to a height of 2,000 metres and over, is characterized by narrow valleys with precipitous walls which extend across the peninsula and connect the corresponding fiords of the opposite coasts, the height of the passes being scarcely 150 metres. The country is thus cut up into deep-walled mountain masses, three of which succeed each other as far as Home bay. Further to the north also the mountains are completely intersected by deep fiords which merge into valleys opening on to the western plains. Precisely analogous features are met with in the extreme north, where Hayes sound appears to form a similar divisional line, and where the valley which connects Greely and Archer fiords separates two mighty highlands.

‘To the west of the range lies a hilly country, apparently quite irregular, and composed of coarse-grained granite. A glance at the fiords of the northwest coast of Cumberland shows the predominance of a northwest and north to south direction in the course of the valleys. The form of the fiords is here very striking; they consist almost everywhere of basins connected by narrow gullies in which rapids are formed by the water flowing into or out of them according to the state of the tide.

‘As we advance towards the west the hills become lower and the valleys broaden until we find ourselves at last on a boundless plain where the Silurian limestones begin—the lakes of this region must certainly be regarded as relics of the sea. The whole eastern half of Fox basin is flat, and the plain is an exposed sea bottom, as is proved by the remains of whales, walruses, &c.

‘Orthographically, the peninsula bounded by Cumberland gulf and Frobisher bay is completely separated from the range described above. The peninsula attains its greatest height in its southern parts, and slopes away to the plain towards the northwest. The northern shore consists exclusively of granite; in the south, limestones (Silurian) occur. Sandstone also has been found in the extreme south.

‘The peninsula of Meta Incognita is also completely independent of the northern plateau, for the plain reaches as far as Frobisher bay.’

Suess further observes: 'I have given this information in full, since it embodies all that we actually know of a lofty and independent range, consisting chiefly of gneiss and extending from the southern part of Cumberland nearly as far north as Cape Walter Bathurst. It is either the direct continuation of the lofty gneiss range, which Dr. Robert Bell followed along the coast of Labrador from Belle Isle strait to Cape Chidley, or at least corresponds very closely in position with such a continuation.'

On both sides of Lancaster sound, the Silurian limestones form a plain gradually sloping to the westward from an elevation of 2,000 feet. About Navy Board inlet this plain is broken by rounded hills, probably of Archæan rock; but the western portion is interrupted only by ravines or inlets. The cliffs of North Somerset indicate that similar features prevail over the greater part of this island. To the westward of the Archæan spur which extends through Boothia peninsula, and along both shores of Peel sound, the elevation of the limestone plain is considerably lowered, and ranges from about 500 feet on the east side of Prince of Wales island to a general level of 100 feet on the west, with some isolated hills reaching elevations of 300 to 380 feet. The southern portion of this island, the eastern shore of Victoria island, and the whole of King William island, is comparatively flat. The greatest elevations noted along the coasts of Victoria island have been approximately, 200 feet. Colville mountains in the southwest are 1,000 feet in height, and Mount Pelly, near Cambridge bay, 800 feet in height, according to Collinson. The interior of the southern part of Banks island has, according to McClure, an elevation of at least 1,000 feet. The limestone cliffs or Nelson head, the highest part of the coast, rise abruptly 850 feet from the sea, but slope away on either side and end in a low beach 20 miles east.

Cornwallis island and the small islands lying to the south deviate somewhat from this regularity. The plain is there more broken, and the structural features quite different. Dungeness at the southeast extremity has the appearance of a table hill; but near Cape Hotham—a few miles distant—the strata dip from 30° to 40° northeast. From Bluff to Cheyne

point on Griffith island, in cliffs 300 to 400 feet high, the dip, increasing from 10° to 30° , is in an east-northeast direction; and on Browne island, limestone strata with a strike south 10° west dip 10° - 30° east. On Lowther island the dip is to westward.

The area of Devonian limestone, extending from Colin Archer peninsula and the adjacent parts of North Devon, to the narrow part of Ellesmere island, westward of the Silurian area about Kane basin, has a considerably greater elevation than the southern part of North Devon. Belcher gives the height of Cape Derby as 2,000 feet, and frequently mentions elevations of 1,500 feet along the northern coast. Colin Archer peninsula, the centre of North Kent, and other elevated portions of this region, are covered with a thin ice-cap, or more properly perhaps a snow-cap, which is not connected with the glaciers of the snow-drift filling the deeper valleys.

A line drawn from the north end of Wellington channel to Prince of Wales strait separates the limestone area already described from an area of sandstone equally as extensive. This includes the greater part of Banks island, the northern points of Victoria island, nearly all of the Parry islands, and Grinnell peninsula. The structural features of this area cause the relief to vary greatly in different parts. The elevation of 600 feet, given for the northeast coast of Banks island, is not far from the general level of the area. The western part of Dundas peninsula is a tableland 1,000 feet in height. Northward of Liddon gulf the general level is only slightly less to Cape Fisher, to the north of which the land slopes away to the sea. The land about Intrepid inlet has an elevation of nearly 500 feet, but the northern and western parts of Prince Patrick island slope gradually beneath the Polar ocean. The land between Hecla and Griper bay and Melville sound, which connects these tablelands with land of equal elevation in the eastern part of Melville island, has a height of from 100 to 300 feet above the sea. Byam Martin and the eastern shore of Melville island is mostly under 200 feet in elevation. The cliffs of the south shore of Bathurst island are mostly from 300 to 400 feet in height. West of Graham Moore bay, they are abrupt to seaward and slope away towards the interior. East-

ward of Allison creek to Cape Capel the land is high; and from Ackland bay limestone appears beneath the sandstone. Near the head of Freeman cove several very sharp conical hills, rising about the plain, have the appearance of being of volcanic origin. Nothing is known of the central portion of Bathurst island, the nearest observations to the interior being in Graham Moore bay, which Bradford describes as full of headlands or islands separated by deep fiords, and with very lofty land in the background. On account of the moderate elevation of the land, and the great thickness of shale interbedded with the sandstone, this is the most productive region of the Arctic archipelago.

A sterile belt formed mostly of overlying Carboniferous limestone occupies the greater part of the northern peninsulas of Melville and Bathurst islands, and is continued through Grinnell peninsula and in Ellesmere island. The line separating the limestone and sandstone areas appears to pass through Ibbett and McCormick inlets. The ranges mapped as crossing these peninsulas, for the most part in an easterly direction, are probably the edges of escarpments of tablelands formed of this limestone. Upon the maps of Richards, Osborn and others, the Jeffries range is given as 1,500 feet in height and the Stokes range, west of May inlet, as 1,300 feet in height. These figures appear to be estimates, as in the only information contained in the reports with regard to the elevation, Osborn places the height of the Stokes range at 3,000 feet. The most conspicuous range on Sabine peninsula extends from the south-southwest direction to Cape Colquhoun, according to Hamilton, with an elevation of 500 to 600 feet; and inland from McDougall point a range of hills is marked on his chart. The St. Armand mountains, southeast of Cape Mudge, are estimated by Richards as 1,500 feet in height, but nothing is said of their formation or direction. On the western peninsula of Melville island, according to McClintock, hills about 500 feet in height approach within a mile of Hillock point; and a lofty range farther inland extending in a north-northeast direction, is intersected by numerous ravines at right angles to the coast line. Grassy cape is described as the extreme of this oblong mass of tableland, and Cape DeBray as a noble bluff headland exactly resembling the hills about Cape Fisher. The scenery about Blackley

Haven was the finest seen by McClintock in the Arctic; the mountainous land across the head, cut up by numberless ravines, resembled a vast assemblage of peaked hills; and the remarkable steep cliff, 930 feet in height, on the south side, is the highest land along the coast, and was recognized at a distance of 50 miles.

To the northward of the Parry islands, the Sverdrup group form a similar succession of plateaus, having a general slope to the north or northwest. Some of these in western Ellesmere and Heiberg islands have a considerable altitude, according to Schei,* who gives the height of Graham island as 1,200 feet to 1,500 feet. Belcher† places the height of Buckingham island between 700 and 800 feet, of North Cornwall as 800 feet, and of Exmouth island where the formation is red sandstone capped by over 100 feet of limestone—20 feet containing Mesozoic fossils—as 570 feet. Isachsen describes the Ringnes islands as being low, the western and northern extremes as regions of low sand banks, and Meheia as the only raised part of the smaller island. The ice remains pressed upon their western shore in wave-like ridges, more or less parallel, and sometimes several yards in height, right up on the land. The western shore of Heiberg island is much higher, and is intersected by fiords. Glaciers occupy the region about the heads of the three fiords in the southeast of the island; but they are not active, though they form the nearest approach to an ice-cap in the sedimentary area.*

The chief source of information bearing on the physical features of the Carboniferous area is the reports of the various lieutenants in charge of the sled parties who traced the coasts of Melville and the adjoining islands during the Franklin search. As this information has been published only in a nearly inaccessible form in the Arctic Papers, a summary will be given of their observations:—

McClintock, in 1851, described the southwestern shores of Dundas peninsula as formed of bold cliffs 450 feet in height, intersected by large ravines. From an elevation of 600 to 700

* *New Land, Four Years in the Arctic Regions*, by Captain Otto Sverdrup, 1904. Geological Appendix by P. Schei.

† *The Last of the Arctic Voyages, &c., 1852-4*, by Sir Ed. Belcher. Geological Appendix.

feet at Cape Ross he saw the similar cliffs and ravines of Banks island. The elevation given in the first instance at least must be taken as fully 300 feet too low. The land northeast of Cape Ross does not present cliffs, but a bold and indented coast, rising towards the interior and being intersected by valleys rather than ravines. Then follows lower land as a margin of increasing breadth along the coast; and eastward of Cape Hopper, high land with steep cliffs. In his journey of 1853, after passing the low shores of the southern part of Hecla and Griper bay, Cape Fisher, with an elevation of 200 feet and lofty land in the interior was reached. The land west of Grassy cape was found to be very low, and that at the northwest extremity of the island of moderate elevation, with gentle slopes, producing little vegetation. The coast trending southwest from Sandy point is described as extremely low, but gradually rising inland. The hills overlooking Kellett strait are from 300 to 350 feet high, with those in the interior several hundred feet higher. The head of Ibbett bay is closed by land of moderate elevation, but the south shore is a bold terraced headland, 750 feet high, very much resembling Cape Dundas, with the strata dipping southwest. The coast line to the south is a noble range of cliffs 600 to 700 feet high, broken at intervals by wide ravines. South of Purchase bay the coast is similar to that between the bays, with a repetition of Terrace cape, 25 miles south. The cliffs along this coast are of sandstone, mostly hard and dark, but with layers of the common pale reddish-yellow variety occasionally appearing. At Wilkie point on Prince Patrick island, at a few hundred yards from the beach, there are steep hills 150 feet in height, upon the sides of which, in reddish coloured sandstone, Jurassic fossils were found. The land in the northern part of Eglinton island, with the exception of Gardner point, is high, in places 600 to 700 feet. Here, as on Melville island, there is much clay ironstone, and the soil is dark. The shores of Jameson bay are low, increasing at Dark cliff, on the northern side, to 150 feet. North of the cliff this elevation is lost in two miles, but two or three miles inland there is a flat-topped elevation resembling a redoubt. Cape Hamphill is extremely low, but the land in the interior is tolerably high. North of the Cape the land has an elevation of 150

feet one mile from the sea, and a greater one inland. The northern part of Prince Patrick island is uniformly low and sandy, with some gravel ridges on the east side reaching 60 feet elevation. Inland from McClintock point the land has an elevation of 150 feet. The Polynia islands nowhere have an elevation of more than 60 feet, and are built up of gravel, among which are many pieces of grey gneiss, granite, and light coloured quartz. On the beach were many bivalves and a few spiral shells. Very heavy polar ice was pressed in against their western shores, large hummocks—some 35 feet high—being forced in upon the beach, and masses of blue ice were seen far inland. Small lichens and mosses formed the principal vegetation in the middle of June. Upon his return, McClintock observed the tide in Hecla and Griper bay to rise 30 inches.

From Meham's diary the following information has been obtained: The south shore of Eglinton island is often hidden by immense hummocks of ice pressed upon it; but as Cape Nares is approached it becomes more abrupt. The western shore of Prince Patrick island is so low, that it could only be followed with difficulty. It consists of a series of low patches of ground, upon the outer edge of which the pack rests, having been driven a considerable way upon the land. At Tullett point a knoll, 40 feet high, is mentioned as the second place suitable for depositing a record, seen since rounding Lands End. Not the slightest appearance of land was seen to the westward. The return was commenced on May 27 from Discovery point, and was made across the land from Parker bay to Walker inlet. The land about Hardy bay, Melville island, has an elevation of about 800 feet. The cliffs along the eastern shore of Murray inlet are about 200 feet high, while near Savage head the land rises in terraces to about 450 feet. Near Bushman cove, Meham gives the elevation as 700 feet, as compared with 800 to 900 feet given by Parry. In many places vegetation was so abundant here on June 24, that the land had the appearance of a rich meadow.

Hamilton describes Cape Mudge of Parry as a hill rising from a low plain, with a spit extending out 4 miles; and the coast north to Cape Richards as very low and uninteresting, being covered with 3 feet of snow May 4-17. He marks on his

chart a range of hills inland from McDougall point, and saw near Cape Richards a conspicuous range extending north-north-east and south-southwest at a distance of 12 to 14 miles south. The northern extreme of Vesey Hamilton island was found to consist of a series of small peaks, not unlike those of volcanic origin, and all the water to taste of some mineral acid thought to be sulphuric.

Bradford, surgeon of the *Resolute*, and assistant to McClintock in 1851, in tracing the eastern shore of Melville island found the land about Robertson point very low and flat, with sandstone ridges showing here and there on the plain; the land around the bay to the north of the point rising in gentle slopes to an elevation of 100 to 200 feet; and the next bluff to the north to be the termination of a high ridge running east from the interior. He mentions that, at an elevation of 500 or 600 feet, the ridges of high land were far above him. Richards, in 1853, mentions King point—400 feet high—as the highest land seen on this coast. From this to Bradford point the land was low except in the interior.

The observations of Commander Richards include the following, upon the northern shores of the Parry islands: Hills, called the Two Sisters, near the eastern end of Sherard Osborn island, off the north coast of Bathurst island, have elevations of about 700 feet. Sandstone on the point near by was compact and yellow in colour. Farther west, Mount Disappointment, 600 feet high, was ascended, the formation being mostly compact sandstone, some limestone, a little slaty coal, all in loose places. The snow ridges along the northern shores of these islands had a direction from west-northwest to east-southeast. At the west end of the Berkeley group the formation was entirely of sandstone in large masses. The land was low for half a mile from shore, rising gently, then more abruptly in east and west ridges, 200 to 300 feet high, the highest summit being 600 feet. At Cape Fortune—elevation 400 feet—sandstone was seen in place. Northwest winds and snow ridges were here the prevailing ones. The tide was estimated at 4 feet. Fossils were found in limestone a day's journey east of Success point. Near Domell point on Melville island the land is from 300 to 400 feet high, with a second ridge of 600 feet behind. Deep

ravines here were said to contain glaciers. The lower land at Cape Colquhoun is sandstone, while on the top—600 to 800 feet elevation—are large masses of limestone and some granite.

Osborn's Journal gives the following information regarding the same region: At Hosken island the limestone gives place to sandstone, and the vegetation increases slightly. Land was seen northward of Helen island, and later to north and northwest. Old floes filled the bays, and about one mile of smooth young ice separated these from the rough pack ice outside. Very old floe was crossed between Helen island and the western part of Bathurst island, and the same filled Erskine inlet, which was seen to be surrounded by bold, buttressed, and snow-covered hills, well marked with deep ravines. At Cape Fortune, the soil was composed of fine sand and light loam, and the coast to westward was low. Vegetation was plentiful, and stone of any kind scarce. Mount Richards, on Cape Fleetwood, has an elevation of 150 feet at a distance of 2 miles from the beach, and is composed of buttressed sandstone containing fossils. From this point, new land—named Finlay land, now King Christian island of Sverdrup—which did not appear lofty at a distance of about 20 miles, covered 10° of the horizon in a north-northeast direction. The northwest extreme of Bathurst island consists of a series of terraces, rising at a distance of 2 miles from the sea to a height of perhaps 200 feet, intersected in all directions by watercourses, and presenting here and there small cliffs of reddish-brown sandstone.

Just to the north of Point Success, 50-80 feet above the sea, a portion of a tree—fossil—was found imbedded in soft sandstone, apparently containing much iron. Fossil bones were also met with, at an elevation of 150 feet, on Rendezvous hill. At Boat beach, Melville island, fossils were found in limestone which was much broken up. At Cape Colquhoun, a layer of limestone forms a tableland above 600 feet of sandstone, and beneath it were found numerous masses, pale indigo, rose pink, and bright yellow in colour, identified by Sir E. Belcher as the selenite variety of gypsum. The land on the peninsula between Erskine and May inlets is the highest seen west of Cape Warrender, and must be about 3,000 feet in elevation. Steep cliffs on the east side of Point Ware are formed of sand and lime-

stone, the former superimposed, and the latter of a dark close-grained slaty nature. The south point of Helen island is almost entirely formed of yellow sandstone; fossil shells, all of one species, are plentiful to a height of 800 feet above the sea. On a point on the south shore of Harvey island the crown and shoulder bone of a whale—almost fossil—were found at 50 feet elevation. Cape Lady Franklin—300 feet high—is mostly limestone; and the isthmus is formed of slaty limestone, in ridges 50 feet high running north and south. The Hooker islands are of limestone formation much worn away.

Organ heights, near Green river, are about 500 feet high. Opposite Cheyne islands the coast is swampy with patches of stoney limestone. The coast line of the southern half of the bay, which is not more than 300 feet high, is on a uniform slope of 45° , intersected by ravines. The high ground appears to be limestone overlying sandstone, between or amongst which there is coal, and a calcareous deposit resembling plaster of paris. In the next indentation to the south, on July 1, a good deal of coal both of the ordinary nature and of a close jetty nature like English sea coal, was found. The land here is less elevated, being 200 to 300 feet high. At Cheyne islands the current was observed running south $2\frac{1}{2}$ miles an hour. The north island is composed entirely of limestone, much broken up and barren.

Dr. Lyall observes that the geological formation westward of Cape Lady Franklin is chiefly of a coarse grey sandstone forming gently sloping hills with intervening valleys and plains. Richards gives the elevation of Cape Elphinstone and of Cape Hooper as 600 feet, and of the land on the south side of Parker strait as 500 feet. The rise and fall of the tide in May inlet, north of Belcarre island, was observed to be 5 feet.

The lakes of the western islands—so far as known—though numerous are of small extent and very shallow. On Melville island none were seen which were not frozen to the bottom during the winter. Many indeed have a depth only of 1 or 2 feet. In the southeast extreme of Cornwallis island some small salmon were obtained by Dr. Sutherland from a lake during the winter of 1850-1.

The drainage affords some features of interest as affecting

the appearance of the surface. From the nature of the climatic conditions there is no underground drainage, the ground never being thawed out to a depth of more than a foot. The precipitation for ten months of the year falls in the form of snow, which is drifted in great part into the hollows and ravines. This is almost entirely melted during one month in mid-summer, and the size of the valleys corresponds to the flow at this season. Where the land is elevated, these take the form of deep ravines, with sides so steep as to be crossed with difficulty. Where the land is low, the valleys are wide and the channels out of all proportion to the flow of water. This is due to the fact that in a shallow depression containing several feet of snow, the course taken by the stream in summer is largely a matter of chance, and varies from year to year. As a result, wide stony channels which are dry except for a week or two follow the course of the valleys.

Structural Features.

The results of the earlier observations, on the region as a whole, have been summarized by Suess, as follows:—

‘All these islands and peninsulas, from the continent of America to the north of the Parry islands, form the horizontally stratified northern border of the great Archæan shield in the north of the continent: the several sedimentary formations of this border are so arranged that they strike east or northeast, and become progressively more recent as they are traced towards the pole.’

This stratified border rests in the east upon the irregular surface of the Archæan area which fringes, on the west, the high and narrow mountain-chain forming the western coast of Baffin bay. The gneiss of the mountain region has been subjected to intense folding, often standing on edge in the direction of the chain. The granite and other rocks of the western fringe are much less disturbed, while in the vast area of stratified rocks folding is almost unknown.

Schei concludes his observations in the Hayes sound, Jones sound, and Eureka-Nansen sound regions, as follows:—

‘The visible portion of the earth’s crust, once covered by the deposits of the different formations in flat layers, has here

undergone disturbances of a radical nature. Side pressure has occasioned folds in the plane of stratification, and a system of fissures has again divided it into plateau-like areas. Of these, some have sunk and others have risen in proportion to their surroundings, giving, in some cases, re-access to the sea; while others, as in Ellesmere, and in Heiberg island, rise to a considerable altitude.

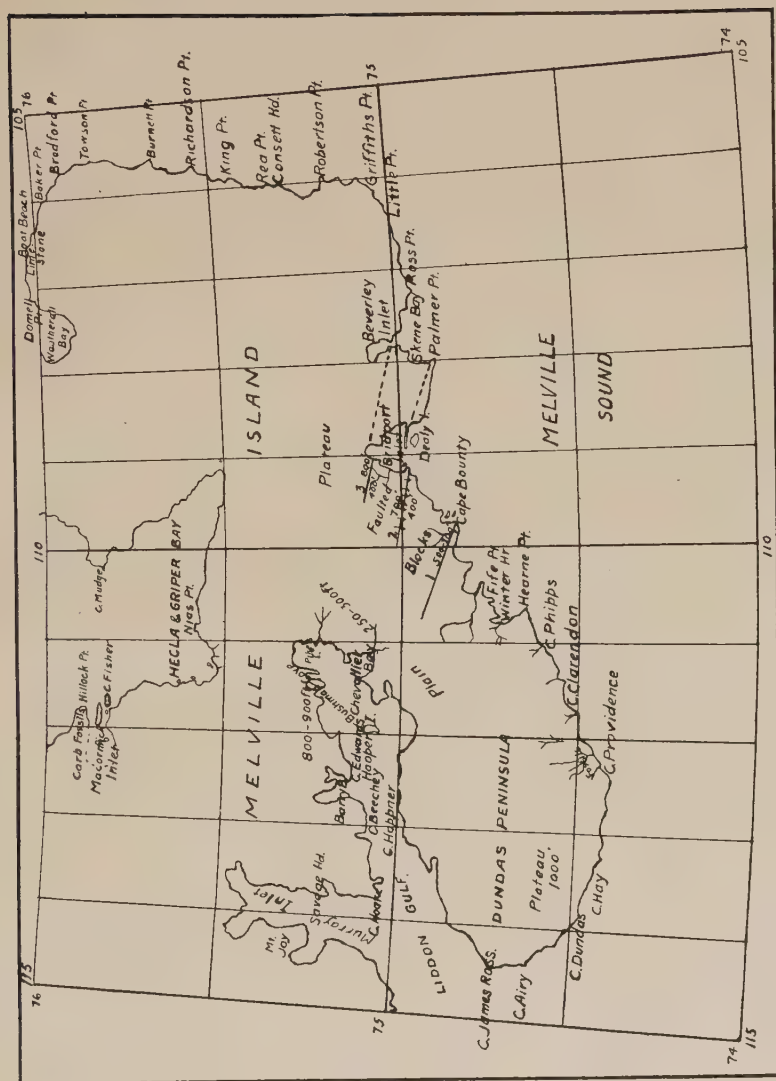
‘It is round the great plane of Archæan rock that the aforesaid sinking took place, and the dip in Hayes sound and the western part of Jones sound is towards the northwest. About Bjornekap and Eureka sound, however, it is just as frequently towards the south-southeast, though without real folding. This does not occur until the northern side of Greely fiord is reached.

‘The movement seems to have been concentrated in the vicinity of Eureka sound. The areas are of comparatively small extent, and the disturbance is plainly visible, the dip of the strata being often 50° to 60° . Possibly connected with the Eureka sound line, as being the place of greatest disturbance, is the circumstance that intrusive masses of quartz-diabases and greenish porphyritic rocks are found in Mesozoic strata.

‘Continuing westward along the coast from Greely fiord, we see folds in the Triassic limestones, slates and sandstones, with their axes ranging northeast and southwest. The folding is nowhere pronounced, and disappears towards Lands Løkk. It does not appear to continue on to Heiberg island, as it does towards Robeson channel where folding was observed by Fielden and DeRance.

‘Wherever Tertiary deposits were observed their stratification was undisturbed, indicating that the more conspicuous dislocations were post-Triassic and pre-Miocene.’

The whole sedimentary border has been faulted into blocks, some of which remain above the level of the sea, forming the western islands of the archipelago, and others which have subsided to a greater extent, form the intervening seas and straits. In the region westward of Lancaster sound, the principal lines of faulting run approximately east and west, but vary in places to east-southeast and east-northeast. Minor faults at right angles to these directions form the other sides of the blocks.



Sketch Map of Southern Portion of Melville Island. (Reduced from Scale of 25 miles to the inch approximately.)
1, 2 and 3 are Lines of Faulting.

Many of these remain practically horizontal and form extensive plateaus, while others are tilted at angles of 5° to 10° .

The southern portion of Melville island has been examined in some detail. The end of Dundas peninsula is a tableland 1,000 feet in elevation. The eastern half inclines to a plain 300 feet high which extends northward past the head of Liddon gulf to the shore of Hecla and Griper bay. On the north side of Liddon gulf the strata dips about 10° to the north, but on Hooper island the dip is as much to the south. Eastward of the plain as far as Skene bay a succession of blocks are tilted towards the north about 10° . The fault lines forming their southern boundaries have a west-northwest and east-southeast direction, as shown on the accompanying sketch. The first runs west-northwest from Cape Bounty; the second is continued through the peninsula in Bridport inlet to Palmer point; and the third crosses this inlet near its head and the entrance to Beverley inlet. At Cape Bounty on the margin of the most southerly block the strata dip in places 10° - 25° towards the sea. Ten miles north in a similar position on the south margin of the next block, sandstone strata with a dip of 50° south, form an escarpment 400 feet high. West of the head of Bridport inlet on the edge of the third block, a thickness of about one mile of sandstone and shale, dipping 50° - 80° south, is cut across by a deep ravine in a similar escarpment. If any folding has taken place it is not apparent; these escarpments appear to be monoclines connecting the different blocks, and the result of unequal subsidence, possibly assisted by slight overthrusting.

Geological Formations.

The first attempt to delineate the limits of the different formations of the Arctic archipelago, based on the results of the Franklin search and earlier expeditions, was made by Prof. Samuel Haughton.¹ This geological map, which is reproduced with additions by the same author, in McClintock's Narrative of the Discovery of the Fate of Sir John Franklin,² forms the basis of all subsequent maps.

¹ Journ. Roy. Dublin Soc., 1858, I., 183-250.

² Capt. F. L. McClintock, the Voyage of the Fox, &c., London, 1859

The most important observations on the geology of northern Ellesmere land were made by Fielden and DeRance of the British expedition of 1875-6. These and other observations to date were incorporated in the Notes to Accompany a Geological Map of the Northern Portions of the Dominion of Canada, by Dr. G. M. Dawson.³

The most valuable contribution to the geology of the Arctic islands has been made by Mr. Per Schei, geologist on board the *Fram*, 1898-1902, in the Smith sound and Jones sound regions.⁴ The observations of Schei on the Cambrian, Silurian and Devonian formations of the southern half of Ellesmere island are quoted in full by Dr. Low in connection with his observations on the Silurian of Lancaster sound.⁵

Archæan.

The crystalline rocks of the eastern side of Baffin island, of North Devon, and of Ellesmere island, and of the Peel sound region, are, for the most part, gneisses and granites or syenites with their included dikes. On both sides of Smith sound a series of altered sediments, associated with dark coloured traps and diabase, in the form of sills, dikes, and large intrusive masses, have been classified by Sutherland¹ with the Tertiary, and by Low as more probably Huronian. These extend southward from Cape Isabella in Ellesmere island, and from Etah to Cape Atholl in Greenland. Other Pre-Cambrian sediments will probably be found when the region has been more closely examined. In Ponds inlet, the River Clyde, and in Cumberland gulf, typical Laurentian gneisses were seen. These often contain garnets at Ponds inlet. North of Clyde river, where faults indicate a subsidence of the area forming the inlet, coarse augen gneiss, and gneiss containing bands and inclusions of amphibolite schist and dikes of pegmatite occur. The Cumberland gulf region has been dealt with in brief in Dr. Low's report, which contains a summary in full of the observations made in the different Archæan regions.

³ Geol. Surv., Canada, Ann. Rep. 1886, R.

⁴ New Land, Captain Otto Sverdrup, 1904.

⁵ The Cruise of the Neptune, Ottawa, Government, 1906.

¹ P. C. Sutherland, Quart. Journ. Geol. Soc., 1853, IX., 299.

Cambrian.

At Cape Camperdown, on Bache peninsula, Schei found the granite overlain by about 500 feet of arkose-like conglomerate sandstone containing about 300 feet in thickness of intruded diabase, merging above into a series of grey sandy, and marl-like schists and limestone conglomerates, interstratified in thin layers, to a thickness of 600 to 900 feet, and interrupted by two compact beds of yellowish-grey dolomitic limestone, each about 150 feet thick. These are again overlain by a series similar to the underlying one, with the limestone conglomerates exceeding the schists.

Leptoplastus sp. in a detached block from one of the two 150-foot beds, and *Anomocare* sp. in a detached block of unknown source—found by Schei—show that this series contains deposits of Cambrian age.

Ordovician.

Sediments belonging to this period have been found by Schei on both sides of Princess Marie bay in Smith sound, and at Havenfiord, South cape, and Bjorneberg in Jones sound. These include at Victoria head, 300 feet of Orthoceras-bearing, greyish-white limestone, a less thickness of limestone alternating with quartz-sandstone, and finally 100 feet of close brown limestone containing fossil Trilobites and Gastropods. The fossiliferous limestone is continued in Norman Lockyer island, and on both sides of Franklin Pierce bay, where it is overlain by thick beds of marly sandstone, quartz-sandstone, and limestone conglomerate, which latter is cut off in the strike by a dark grey, brecciated limestone.

At Havenfiord quartz-sandstone is followed by a series of limestone conglomerates with marly schists and pure limestones of a thickness of 1,200 to 1,500 feet. These are again overlain by at least 200 feet of hard, impure limestone, brown and yellowish-grey in colour. South cape is entirely composed of this brown limestone, containing in the lower layers *Maclurea* sp., referred by Schei to the Middle Silurian.

Maclurea sp. found by McClintock at Fury point, in Bellot strait, and on the west coast of King William island, indicate the occurrence of Ordovician in that region.

Seventy-two species, identified by Schuchert from fossils in the limestone of Silliman's Fossil Mount in Frobisher bay, are all referred by him to the Galena-Trenton.¹

Silurian.

The yellow and drab limestones of this age have a wider distribution than that of any other formation in northeastern America, extending as they do, from Ellesmere island to Victoria island and to western Baffin land on either side of the Archæan spur. No distinctive break separates these marine sediments from those of the Ordovician below or the Devonian above.

North of Jones sound, the brown limestone extends from South cape to Hell Gate; the upper part west of Bjorneberg, Schei refers to the earliest Silurian or Llandovery. A series (B) of pure dark limestone, lying conformably above the brown beds, referred from the determination of fifteen species to the Wenlock, and of superposed black shale and fragmentary limestone, referred from the determination of a dozen species to the Ludlow, has a thickness of 1,000 feet. In Hell Gate and Gaasefiord these strata are overlain by a series (C), consisting of sandy, marl schists, followed by quartz-sandstone, and argillaceous sandstone with a thickness of 1,000 feet.

In Cuming creek, North Devon, Dr. Low found Silurian fossils of about the horizon of the Niagara, in the lower layers of a 1,000 foot bed of light grey limestone which overlies 50 to 100 feet of red and purple shales and thin-bedded sandstones; and in the lower cliffs at Beechy island, obtained a large collection of fossils of this age.

Silurian fossils have been collected by McClintock and others, from the following additional localities:—

Cornwallis island—southeast and southwest extremes.

Griffiths island—east end.

Browne island.

Garnier bay and Port Leopold on North Somerset.

Cape York—south side of Lancaster sound.

Possession bay—Bylot island.

¹ Lower Silurian Fauna of Baffin Land, Proc. U.S. Nat. Mus., XXII., 143.

Port Bowen and Fury point in Regent inlet.

Depot bay—Bellet strait.

East Boothia—Cape Farrand, latitude $71^{\circ} 38'$, longitude, $93^{\circ} 35'$.

West Boothia—vicinity of the Magnetic Pole.

Prince of Wales island—east side.

King William island—west coast.

Princess Royal islands—Prince of Wales strait.

Appendix A to this report is the determination, by Lawrence Lambe, Geological Survey, Ottawa, of the fossils collected by me from the Silurian limestones.

Devonian.

The only one of the early expeditions which collected fossils of Devonian age was that of Sir George Nares to Robeson channel and northern Ellesmere land. These were found in Dana bay, latitude $82^{\circ} 30'$ north.

Our knowledge of the Devonian of this region is due almost entirely to the researches of Schei in southwestern Ellesmere land, where beds of this age occur. These include above series C which may be either late Silurian or early Devonian, a series (D) of dark limestones and shales at least 1,500 feet in thickness, containing 55-60 fossils corresponding to those of the Lower or Middle Devonian, and a series (E) of quartz sandstones, 900 to 1,200 feet in thickness containing fossils characteristic of Upper Devonian.

Devonian sediments are probably included in the series of sandstones and shales occupying Bathurst, Melville and Banks islands, but, so far, no fossils of this age have been found in these exceedingly barren beds, unless *Terebratula aspera* (Schlotheim) in the underlying limestone in the Princess Royal islands is of Devonian age.

At Cape Derby, North Devon, and at the south end of Arthur fiord, Belcher found limestone resembling Derbyshire marble and containing *Entrochi* and *Terebratulæ*. The summit was of greywacke slate.

Carboniferous.

The earliest rocks of this age—from their relationship, likely Lower Carboniferous—consist of a remarkable series of light coloured sandstones, often cross-bedded and more or less friable, clayey sandstones and shales.

The fossil remains previously obtained in this series comprise: Impressions of bivalves in argillaceous ironstone brought from Liddon gulf by Parry—*Avicula Melvilliana* of Koenig. Casts and shells of a brachiopod found in yellowish-grey sandstone, in situ, on the southeast coast of Byam Martin island by McClintock. This fossil is described by Haughton as a ribbed *Atrypa*, allied to *A. primipilaris* of Von Buch (found at Gerolstein in the Eifel, in Upper Silurian strata), and to *A. fallax* of the Carboniferous slate of Ireland.

The fossils collected by the writer have been examined and described—see appendix—by the palæontologists of the Geological Survey. These include the following: *Lingula melvillensis*, from beds of shale in the second ravine northeast of Cape Providence and elsewhere in clay ironstone; *Estheria canadensis*, found abundantly in clay ironstone at an elevation of 450 feet in the first ravine—4 miles—northeast of Cape Providence, and more rarely in shale as above; *Carbonicola arctica*, found in a fragment of reddish-grey argillite, of unknown source, on the east shore of Liddon gulf, impressions and carbonized remains of plants bearing a Carboniferous aspect—Calamites, Sigillaria, and probably Ulodendron.

Carboniferous limestones with characteristic fossils have been found at the following places:—

Hillock point, Melville island, by McClintock, containing *Productus sulcatus* and *Spirifer arctica*, described by Haughton in the Journ. Roy. Dublin Soc., Vol. I.

Cape Lady Franklin, Bathurst island, where *Spirifer arctica* and *Lithostrotion basaltiforme* were obtained by Osborn.

‘At many other points along the north shore of Bathurst island Carboniferous fossils in limestone, cherty limestone, and earthy fossiliferous limestone with the Byam Martin species of *Atrypa*, were found by Osborn.’—Haughton.

Whitmore point, North Devon, where the following fossils were found by Belcher, and identified by J. W. Salter, F.G.S.: *Fusulina Hyperborea*, *Stylaster Inconferla*, *Zaphrentis ovibos*, *Clisiophyllum Tumulus*, *Syringopora*, *Fenestella arctica*, *Productus semireticulatus*, &c.

Bjornekap, Ellesmere island, where Schei found brownish-grey, hard, fossiliferous limestone, and higher up white pure limestone, flinty limestone and pure flint strata, rich in fossils, among which were *Lithostrotion*, *Fenestella*, *Streptorhynchus*, *Thynconella*, *Spirifers*, *Productii*, &c.

‘At Svarte Vaeg (Black Wall), north point of Heiberg island, above flint strata which presumably bears Carboniferous fossils is found strata of Labradorite porphyry, amygdaloid, melaphyre-amygdaloid, and tuffs which are probably Carboniferous as they are covered by strata of flint resembling the underlying ones.’—Schei.

Outliers of Carboniferous limestone have been reported by Dr. Armstrong, of the *Investigator*, at Cape McClure and near Mercy bay on Banks island. On the present voyage fossiliferous limestone was obtained from the top of the cliff, 16 miles southeast of Cape Hamilton, on the same coast. At Boat beach, on Melville island, broken fossiliferous limestone has been reported by Richards and Osborn. West of the Devonian of Dana bay, on the northern coast of Ellesmere island, limestones of this age have been found.

The localities where limestone, not known to be fossiliferous, has been found in the northern part of these islands, are the following:—

Cape Colquhoun, above 600 feet of sandstone.

Point Vare, Bathurst island, underlying sandstone.

At various points on the coast, and adjoining islands, of the northeastern peninsula of Bathurst island.

Mount Acland, west side of Grinnell peninsula.

Port Refuge, south coast of Grinnell peninsula.

McClintock states that, ‘Point Wilkie appears to be an isolated patch, of Liassic age, resting upon Carboniferous sandstone and limestone, with bands of chert, of the same age as those of Melville island. The eastern shore of Intrepid inlet

is composed of this formation; while the western is of the underlying Carboniferous rock.'

The condition present from Ordovician times of a continually emerging continent, gave place during this period to a submergence of the land, as evidenced by these limestones which overlies sandstones of Early Carboniferous and Devonian age.

Appendix A to this report is a determination by Lawrence Lambe, of the fossils in Carboniferous rocks collected by me.

Mesozoic.

Fossils belonging to this period were found by the Franklin search parties at Wilkie point on Prince Patrick island, Success point, on Bathurst island, and on the top of Exmouth island at an elevation of 570 feet.

McClintock makes the following observation: 'At Wilkie point, a few hundred yards from the beach there are steep hills about 150 feet in height, and upon the side of these, in reddish coloured sandstone, casts of fossil shells abound.' These were examined by Prof. Haughton, and described or named as follows: *Amonites McClintocki*, *Monctis septentrionalis*, *Pleurotomaria* sp., *Nucula* sp., and a cast of some univalve. Professors Neumayr and Waagen when consulted referred the ammonite to the Jurassic. This view was taken by the Roy. Geol. Soc.

Professor Haughton remarks in his treatment of the Mesozoic-Geological appendix referred to above, that, 'Captain Sherard Osborn found broken vertebrae of an ichthyosaurus, 150 feet up Rendezvous hill, at the northwest extreme of Bathurst island.

Sir Edward Belcher observes, regarding the locality on Exmouth island: 'The summit is capped by a reddish limestone formation of about one-fifth of the entire height, resting on friable, disintegrating sandstone, having a dip at its western end of 7°. Salter identified from this limestone, fossil remains of vertebrae and portions of the rib of an ichthyosaurus, *Spirifer Keilhavi*, and *Productus cora*.

Mesozoic rocks were found by Schei, in the western part of Ellesmere island and the eastern part of Heiberg island. They are described as follows: 'The coasts on both sides of Eureka

sound consist chiefly of quartz-sandstones and subordinate schists and limestones. Fossils are only found in a few specimens, taken from, in all, five places. Thus from Ammonitberget on the northern point of Bjornekaplandet was taken an ammonite, and some lamellibranchs among which is *Daonella Lommellii*. Likewise an ammonite and lamellibranch from the marly sandstone on Hatöen, east of Storöen, and from the Black shale of Blaafjeld—Blue Mt.—the southern extreme of Grant land, *Daonella* sp.’

As already mentioned, eruptive rocks are included in this series of Triassic sediments.

Tertiary.

Deposits of this age, often containing seams of coal, have been found in many widely separated areas in the Arctic islands. They consist for the most part of sand, and are not readily distinguished from later deposits. In the region about Davis strait, these include besides the sediments, considerable thickness of volcanic eruptives. Cape Searle, as previously noted, is formed of at least 800 feet of volcanic agglomerate and stratified tuff.

The localities where Tertiary beds have been found, include the following: Durban island, Isabella bay, Eclipse sound in Baffin island, and Cape Hay on Bylot island, lignite being found at Durban island and Cape Hay; in various places between the 81st and 82nd parallels about Lady Franklin sound, as outliers on the Cape Rawson beds—Mesozoic?—bituminous coal being found near Cape Murchison, Lake Hazen, and Lincoln bay—82nd parallel. These areas have been fully dealt with in the works referred to.

‘In the depressions between the mountains abutting on Eureka sound are in many places thick deposits of quartz-sand with imbedded strata of lignite. The same is also the case in the lowlands east of Blaamanden, and at the head of Stenkulfjord (Stone coal) in Baumannfjord. In addition to the lignite, masses of slaty coal were found in which were well preserved remains of *Sequoi Langsdorfi*, *Taxodium distichum*, var. *miocenium*, well known witnesses to a southern vegetation in a geologically late period, i.e., the Miocene.’—Schei.

The deposits of Ballast beach, Banks island, are described by McClure, as follows: 'Extending along a range of hills varying from 350 to 500 feet above the sea, and from half a mile upwards, inland, there are great quantities of wood, some of which was rotten and decomposed, but much of it sufficiently fresh to be cut and used for fuel. Whenever this wood was in a well-preserved state, it was either detected in ravines, or had been recently exhumed from the frozen soil.' Armstrong says of this area: 'Trunks and branches of trees, one 26 by 16 inches in diameter and another 3 feet in circumference, were found in loamy soil at an elevation of 300 feet. Some of these were quite fresh, but hard and dense; others dark and semi-carbonized. Some approached lignite in character; others were impregnated with limonite and silicified. Pine cones, &c., were among the remains. Several miles inland at an elevation of 600-700 feet, similar conditions prevail.'

Mecham's Journal contains this description of another area: 'On the return across Prince Patrick island, in a ravine west of the head of Walker inlet, a large tree 4 feet in circumference was observed protruding 10 feet from the bank. Parts of other trees showed just above the white sandy soil, one was 30 feet long and another 34 inches in diameter. The wood was similar to that found at an elevation of 90 feet in the cliff at Cape Manning, the southwest point of the island.' McClintock is credited with similar discoveries, but no mention is made of them in his journal, except as to finding decayed wood at the north end of the island.

Dr. Oswald Herr¹ refers this wood to the Miocene in his *Flora Fossilis Arctica*, in which the following species are described by Cramer: *Pinus MacClurii*, *Pinus Armstrongii*, *Cupressinoxylon* cfr. *pulchrum*, *polyommatum*, *dubium*, and *Betula McClintockii*.

From these observations it is apparent that the southwest of Prince Patrick island, and portions of the northwest of Banks island are occupied by Tertiary sediments. The remainder of Prince Patrick island, excepting the Mesozoic area about Wilkie point, has been mapped by Haughton as consisting of Carboniferous limestone. The journals of McClintock

¹ *Flora Fossilis Arctica*, I., 1868; see also II., 1811; V., 1878; VI., 1880.

and Mechem make no mention of limestone being found on Prince Patrick island, except on the west side of Intrepid inlet. It seems much more probable that the western portion of the island, at least, is occupied by sediments of Tertiary age.

Schei found Tertiary fossils on the northwestern point of Graham island, and from the description of the Ringnes islands, by Captain Isachsen, it seems not unlikely that these, too, may be of Tertiary formation.

Post-Tertiary.

Post-Tertiary sands are found on the shores of the Arctic islands, with certainty, up to elevations of 50 feet. The few shells, collected by the writer, at an elevation of 10-20 feet, have been identified by Mr. Lambe, as those of living species. Dr. Walker, surgeon of the *Fox*, collected at Port Kennedy, Bellot strait, at elevations from 100 to 500 feet, specimens of *Saxicava rugosa*, *Astarte Borealis*, *Mya truncata*, *Cyprina Islandica*, *Tellina proxiana*, *Mya Uddevallensis*, *Cardium* sp., *Buccinum undatum*, *Balanus Uddevallensis*. The finding of shells of living species proves little regarding a former submergence of the land, for these may have been carried to their present position by sea-birds; so with bones—with the exception of the largest—of sea animals, some of which were found about a mile inland. Terns, jaegers, and gulls during or before their nesting season feed largely upon the invertebrate animals, carried up by the tide through cracks in the ice. The finding of large bones at greater elevations would tend to show the existence of such deposits up to elevations of 500 feet. In this connection, mention might be made of the finding by Osborn, of the crown and shoulder bones of a whale—almost fossil—50 feet above the sea on the south shore of Harvey island; and by Belcher, of the head bones of a large whale on Mount Parker, Bere Bruce point, and an imbedded whale on Cape Disraeli, North Devon, both at about 500 feet above the sea.

(Marine) Terraces.

Fairly distinct terraces were observed at Winter harbour, at elevations of 60 and 105 feet, with three intermediate and less distinctly marked; and on the point 2 miles east at eleva-

tions of 45 and 100 feet, with an intermediate terrace at 80 or 90 feet above the sea. On Browne island, 20 to 24 rather conspicuous terraces were counted in the first 200 feet, and on the west shore two at 15 and 55 feet were quite distinct. That these were former beaches would be inferring too much, as they may have been due to inequalities of hardness in the strata.

Terraces were found by Schei, in the Smith sound region, at elevations of 344, 384 and 570 feet, and at the head of Goosefiord in Jones sound at 466 feet. Erratic blocks were noted by him at about the same elevation—600 feet—as the terraces in the pass between Trolld and Bay fiords. This would appear to be evidence that the terraces were connected with the glaciation.

Glaciation.

No glacial striæ were observed by the early explorers in the region west of Lancaster sound. On the present voyage, glacial markings were found at the head of Liddon gulf, Melville island, upon an outcrop of hard, white sandstone. These consisted of striæ south 65° - 80° west, furrows in a direction north 70° - 80° west, and some indications of grooves running in a northwest direction. The principal striations run in the direction of Liddon gulf, and the marks may be the result of local glaciers when climate conditions were more severe. No others were seen on Melville island, but sandstone would in any case afford a very poor surface for their preservation.

From the observations of McClintock and others on the distribution of drift boulders over the western islands, Prof. Haughton came to the conclusion that the drift had been northward and due to floating ice. In an able summary of the evidence provided by erratics, and by masses of copper—thought to have come from the Coppermine river—which were said to have been picked up by the natives in Prince of Wales strait, Dr. Dawson concluded that the movement had been from south to north over practically the whole area. Tyrrell located one centre of the great ice cap near the west shore of Hudson bay, and inferred that the moisture necessary for such an accumulation of ice was derived from an open Arctic sea.

Boulders and fragments of various Archæan rocks and pieces of Silurian limestone are to be found on Melville island

up to elevations of 800 feet. The evidence produced of drift boulders of North Somerset granite found at Graham Moore bay, Cape Rennell, and Port Leopold, is not very conclusive. Following the same line, another might infer that graphic granite found at Bridport inlet, Melville island, came from Cape Warrender where such granite is known to occur. The evidence deduced from the finding of masses of native copper in limestone areas is perhaps more conclusive. In this connection, mention might be made of the finding by one of our seamen of a piece of native copper, containing crystals of calcite in the gravelly soil at Winter harbour.

Granted—as has been supposed by Suess—that Baffin bay remained an unsubmerged portion of the continent until comparatively recent times, the presence of boulders and fragments of Archæan and Silurian rocks on the western Arctic islands would be amply accounted for by the carrying agency of floating ice.

Economic Minerals.

The extensive area of Archæan rocks in Baffin and Ellesmere islands, which forms the most promising territory from an economic point of view, must still be considered practically unknown; and no part of the Arctic islands has been more than casually prospected. Nor can this region be said to be too distant to attract the enterprising: six days brought us from the middle of Hudson strait to Belle Isle. The 70th parallel crosses the northern part of Alaska, while almost two-thirds of Baffin land lies to the south of this line. For successful work in this region, however, it is necessary to remain over winter, as the open season for navigation is in the autumn months.

Precious metals, so far, have not been found northward of Hudson strait, but are quite likely to occur either as veins or as placer deposits in Tertiary sands.

Dr. Rae found quartz, coloured by oxide of iron, and containing minute particles of gold, on the shore of Repulse bay, $66^{\circ} 30'$ north, 87° west.

Copper.—The region of the Coppermine river—an undoubtedly promising area—is outside the limits of this report. Mention has been made of copper found as drift in Prince of

Wales strait, and on Melville island. Copper stains were seen on the sandstones near Cape Providence.

Iron.—Pieces of clay ironstone are abundantly distributed over the Carboniferous sandstone of Melville and Bathurst islands. Thin layers occur in the shale at various places. The quality is such as hardly to be considered of economic value.

Gypsum.—This mineral has been reported from near Port Bowen, Batty bay, and Port Leopold in Regent inlet, and from various places to the westward, notably at Cape Colquhoun, in the north of Melville island, and near the eastern end of the Jeffries range on Bathurst island, where limestone formed the upper part of the cliff at Cape Colquhoun, masses, pale blue and rose-pink in colour, were found by Osborn among red and green earth resembling dust of copper. Near Sargent point—east coast of Bathurst—a calcareous deposit is mentioned as occurring with or amongst sandstone with overlying limestone.

Petroleum.—Pitch mount in Arthur fiord, North Devon, is described by Belcher as of whinstone formation with strong naphtha and asphalt affluviun. The limestone erratics on Melville island have included so much of the gaseous products of distillation that the fetid odour was detected by Parry from the cart wheels striking the stones. A similar odour is given off when the limestone of Browne island is broken. These observations indicate the possibility of petroleum being found in the limestones and dolomites of the central region.

Coal and Bituminous Shale.—Regarding deposits of coal, Prof. Haughton remarks: ‘I have marked on the map the coal-beds of the Parry islands, as observed by Captain McClure. The discovery of coal is due to Parry, but the evidence of the extent and quantity in which it may be found was obtained during the expeditions under Austin and Belcher. In addition to the localities surveyed by himself, Captain McClintock has given me specimens of the coal found at other places by other explorers; and it is from a comparison of these specimens that I have ventured to lay down the outcrops of the coal-beds, which agrees with the boundary of the formations as laid down from entirely different data.’

And regarding the quality, he states that: ‘The coal found

in the Arctic islands, excepting that of Tertiary age at Disco island, Greenland, presents everywhere the same character It is of a brownish colour and lignaceous texture, in fine layers of brown coal and jet-black, glossy coal interstratified in delicate bands not thicker than paper. It has a woody ring under the hammer, recalling the peculiar clink of some of the valuable gas coals of Scotland. It burns with a dense smoke and brilliant flame, and would make an excellent gas coal; and, in fact, resembles in many respects the celebrated Torbane Hill mineral.'

So much has been inferred in the above statements that it becomes necessary to give a summary of the statements, made in the journals of the different officers, who explored these coasts, regarding the discovery of coal. Lumps of coal were found by Parry about Griffiths point, Melville island, and between Winter harbour and Fife harbour, but most abundantly near Cape Clarendon, where on September 9, 1819, two-thirds of a bushel was obtained. This was found to burn with a clear lively flame, like cannel coal, but without splitting and crackling.

McClintock found similar pieces of coal at many points on the beach, and in the ravines along the south shore of Melville island, in 1851. These include a few small pieces east of Ross point, and in a ravine $1\frac{1}{2}$ hours west of Ross point a quantity which would not burn alone; along the shore near Cape James Ross, where the cliffs were of sandstone passing into blue quartzite, much coal harder and heavier than that seen to the eastward, and in the mouth of a ravine on the south side of Liddon gulf some of a much better quality than any hitherto seen, containing a considerable quantity of iron pyrites.

About a hundredweight of coal was collected by Mechem in October, 1852, in the bed of a ravine emptying into Liddon gulf directly south of Hooper island, and a similar amount at the same place in April, 1853. He remarks that, 'There appears to be a large quantity, as what we found was merely showing above the snow.' Large lumps of coal were also obtained by Mechem in the bed of a ravine at Bailey point, on the opposite side of the gulf from Cape Ross. Small pieces of coal were found by McClintock, in 1853, along the cliffs on the

east side of Kellett strait, and a few fragments in a ravine in a range of cliffs on the eastern side of Intrepid inlet. Similar fragments were found by M. DeBray, on an island north of Cape Fisher.

Lieutenant Hamilton collected about ten pounds of coal in a deep ravine, when about one-third of the way across the isthmus, between Bridport inlet and Hecla and Griper bay. On the return, in June, fully a hundredweight could be obtained. Lieutenant Pim found pieces of coal in several places when crossing this isthmus, one of which weighed ten pounds. On the return journey, forty pounds in pieces up to five or six pounds was obtained in one ravine. Digging where small pieces, stuck on edge, covered the side of the ravine, did not increase the supply.

Three and a half hours east of Cape Gillman, Byam Martin island, a few small pieces of coal were found by McClintock, and on the shores of the most southerly arm of De la Beche bay, Bathurst island, many small pieces were seen. Specimens of coal were picked up by Dr. Bradford, in a run of water on shore northwest of Scoresby point. Lieutenant May found pieces of coal on the south shore of Sherard Osborn islands. Osborn reports fragments in the valleys on the north shore of Helen island; some good specimens on the beach north of Green river, Bathurst island; at the mouths of ravines, on the south shore of the same bay, sandstone strata between or amongst which there is coal and a calcareous deposit resembling plaster of paris; and in the next indentation south a good deal of coal, both of the ordinary nature and of a close jetty nature like English sea coal, some of which was used for cooking.

Passing now to Banks island, coal was reported by McClure about the middle of the west shore of Mercy bay. F. J. Krabbe, master of the *Intrepid*, found coal in the bed of a ravine near the headland southeast of Cape Hamilton—presumably about 15 miles from the cape. There were numerous pieces from 6 to 18 inches square but somewhat thin, finely laminated and waterwashed. None was seen over 2 inches thick. It could be separated by the hand into plates $\frac{1}{16}$ to $\frac{1}{8}$ of an inch thick. It burned well, lighting with a match. The cliffs—700 feet in

height—were composed of sandstone of different shades, beautifully castellated. The dip was about 5° to southeast and to northwest from the cape. Abundance of coal was also seen along the cliffs—600 feet high—at Cape Hamilton. A search was made by Krabbe for veins in each place, but none were seen. Dr. Domville reports coal in the cliffs 4 miles southeast of Cape Hamilton, occurring as fragments and black detritus at the foot and as an immense block protruding from the surface near the top. The part exposed was dull in character and slaty, exhibiting less bituminous matter when fractured or upon ignition than that found lower down, which was bright and vitreous and burned satisfactorily. Lieutenant Pim also reports gathering forty pounds in a few minutes.

Two parties from the *Arctic* passed Cape Hamilton on their way to Bay of Mercy in May, 1909. W. Johnson, boatswain, reported seeing, from a distance of half a mile, a coal seam at an elevation of about 400 feet in the cliffs 8 to 10 miles east of Cape Hamilton; he described it as lens-shaped, about a mile in length, from 40 to 50 feet thick in the centre, the central half being over 10 feet thick. Two men went to the foot of the cliff and picked up some pieces of coal, but no other sample was secured, nor was the seam itself reached. Pieces of coal were obtained by R. Pike, a member of the second party, 1 mile up a ravine in this locality—9 miles east of the cape—but no seam was seen by him. In the east side of a ravine, $3\frac{1}{2}$ miles distant from the cape, he and a fellow seaman, W. Doyle, obtained a sample from a coal seam 3 feet thick, at an elevation in the cliff of about 25 feet. This coal was vitreous in lustre, light in weight, and broke with a conchoidal fracture. It bore no resemblance to the coal found as loose pieces on Melville island. Others of the party who did not visit the seam, placed the thickness at 9 feet.

An effort was made by the writer to visit as many as possible of the localities where coal had been found on Melville island. As might be inferred from the summary, since made, of all the references to coal in the different journals, no seams could be found where these have been mapped. East of Dealy island, no pieces even were found near the shore. The head of Beverley inlet on the same line of outcrop was not

visited, and, for that matter, McClintock, when mapping the inlet, went only part way in. The direction of the outcrop must have been inferred, and is altogether an impossible one, the strike of the rock being here, east-southeast, not northeast. The parallel seam northwest of Ross point was evidently marked on the strength of the reference by McClintock to a quantity of coal in a ravine, which would not burn alone. As regards the outcrop marked north of Chevallier bay, Liddon gulf, no pieces of coal could be found thereabout, though they were quite plentiful on the shore several miles north and south of this point. Nares was the officer who passed nearest to the point, and by the chart of his route, at a distance of 5 miles. Similar remarks apply to the location of coal seams on Byam Martin and on Bathurst island. No reference is made in the journals other than to pieces of coal, and the so-called lines of outcrop have never been visited. The most promising locality for coal on Melville island would seem to be on the shore of Liddon gulf directly south of Hooper island, longitude 112° , and on Bathurst island near Sargent point on the east coast, in latitude $76^{\circ} 10'$. The former locality, where Meham had no difficulty in collecting a hundredweight on two occasions from beneath the snow in the mouth of a ravine, would have been visited, had these facts been known, when in Liddon gulf.

On the east side of Winter harbour where pieces of coal were found by Parry, lumps of bituminous shale several inches square but never more than two inches thick, were often brought in by members of the expedition. This material answers the description given of some of the coal found near Cape Hamilton, Sargent point and other localities. The entire coast of Melville island, in much of which several hundred feet of strata are exposed in the cliffs, has been searched without finding the source of this bituminous shale and coal. Thin seams are probably present in these early Carboniferous sandstones and shales. The outstanding facts are that lumps of the nature of cannel coal and of bituminous shale are to be found in almost all parts covered by this series, and in the vicinity of Cape Hamilton, Banks island, seams of coal appear to have been found.

The description of the Tertiary coal and lignites has been mentioned in connection with that formation. The coal beds

of Watercourse bay, near Cape Murchison, are described by Sir George Nares as follows: 'This deposit of coal is exposed in a ravine for a distance of over 200 yards. At its greatest exposure the thickness of the seam is 25 feet, but we had no means of telling how much it descended below the level of the stream. Above the coal are beds of shale and sandstone. In these shales were found a considerable number of leaf impressions, similar to those found in the Miocene coal-bearing strata of Disco island, &c., leaving no doubt as to the geological age of the lignite. The coal was tried by our engineers and pronounced equal to the best Welsh coal.' This coal contained only 2 per cent of moisture, but this comparison with Welsh coal is made by almost every expedition. Lieutenant Lockwood's report to Lieutenant A. W. Greely on the coal referred to by the British expedition of 1875-6 is as follows: 'The coal is soft and lies in two deposits which are probably connected and form one seam. The largest is exposed for about 100 yards along the bed of the stream, its front vertical and about 20 or 25 feet high by, perhaps, 4 deep, covered on top by a mass of slate. The second seam is much smaller and probably 100 yards farther down stream; the coal lies in thin strata, some of which I readily pulled down by hand.'

The following analysis of coal was made at the Department of Mines, Ottawa, and the report submitted by Eugene Haanel, Ph. D., Director of Mines:—

Proximate analysis.	(31)	(40)	(41)
Moisture.....	3·83	0·97	1·42
Volatile matter.....	36·11	40·13	46·60
Fixed carbon.....	46·78	16·71	33·13
Ash.....	13·28	42·19	18·85
	100·00	100·00	100·00
Elementary analysis on Dried samples.	(31)	(40)	(41)
Hydrogen.....	4·78	4·19	4·84
Carbon.....	66·04	43·71	63·98
Oxygen, Nitrogen, Sulphur.....	15·40	9·68	12·12
Ash.....	13·78	42·42	19·06
	100·00	100·00	100·00

Analysis of Ash.	(31)	Analysis of Ash.	(41)
Silica.....	62.40	Silica.....	60.80
Alumina.....	31.80	Alumina.....	36.00
Lime and magnesia traces undetermined.....	5.80	Lime and magnesia traces undetermined.....	3.20
	100.00		100.00

M. F. CONNOR,
Chemist.

Oceanography.

The currents in these inclosed seas trend, as a rule, easterly and southerly. The measurements give usually a velocity of about 2 miles an hour. Such currents were noted by Osborn in Queens channel, and by Parry in Lancaster sound. Near Cape Hay in McClure strait, Parry observed a current setting to the westward against a fresh gale from that quarter, and estimated it at 2 miles an hour. A more accurate determination of the rate is probably obtained from the drifting of vessels when helpless in the ice. The *Advance* and the *Rescue* drifted during October and November of 1850, from Maury channel to Lancaster sound at a rate of a mile and a half a day; through Lancaster sound, in the month of December, at the rate of 7 miles a day, and to Cape Wolsingham in Davis strait in the next five months at a rate of 4 miles a day. The *Resolute* abandoned in April, 1853, 20 miles off Cape Cockburn, drifted through Barrow strait and Lancaster sound, and was picked up the following year by an American whaler in Davis strait, near the point where the two latter ships were set free from the ice. This represents a drift of at least 1,000 miles. Some members of the crew of the *Polaris* who were drifted away on the ice in the northern part of Baffin bay were rescued six and a half months later, off the Labrador coast, 1,500 miles south. This represents a drift of about 8 miles a day.

So far as known, these seas appear to be comparatively shallow. Lancaster sound is nowhere much deeper than 300 fathoms, and Barrow strait mostly under 100 fathoms in depth. Austin and Byam channels, and Melville sound within 10

miles of Melville island, are of the same shallow nature, the only sounding over 100 fathoms being one of 225 fathoms off Cape Providence. One mile off Ballast beach, northwest shore of Banks island, the depth was 100 fathoms, and north of Burnett bay, 60 at 400 yards from the cliffs and 15 where the water touched them. South to Cape Kellett, Banks island has a low, shelving shore, and south of the cape the beach is still low. Between this island and the continent the depth would appear to be mostly under 100 fathoms. The middle of Prince of Wales strait has a depth of 37 fathoms, and north of the Princess Royal islands between 5 and 20 fathoms. South of King William island, Amundsen found in one place only, 3 fathoms. The only sounding north of the Parry islands gave no bottom at 400 fathoms. This was made in Belcher channel, 5 miles off Cape Stanley, near Cardigan strait. Excluding Baffin bay, a large portion of which is probably more than 1,000 fathoms in depth, the other seas and connecting channels appear to be less than 500 fathoms deep. The results of the tidal observations at Winter harbour will be found in a separate report. Westward of Baffin bay, where the tides rise 12 to 15 feet on the shores of Bylot island, no high tides occur. McClure mentions that the flood tide comes from the south in Prince of Wales strait, and rises about 3 feet at spring tide and little, if anything, at neap tide, and that the tide rose about 2 feet in Bay of Mercy. The tide has been observed to rise $2\frac{1}{2}$ feet in Hecla and Griper bay, about 1 foot in Byam Martin channel, and about 5 feet in May inlet north of Bathurst island. The following tables give a record of the temperature of the sea water; its contents in chlorine, as a measure of the salinity; the hardness, or total of calcium and magnesium salts; and the alkalinity or total carbonates, both expressed as equivalent parts of calcium carbonate in 1,000 parts of water; and similar tests of drinking water obtained largely by melting snow or floe ice. These determinations were made with the tablets used by the United States Geological Survey for water assay, without the proper portable assaying outfit, as this did not arrive in time. The results are comparative, and an idea of their accuracy may be obtained by a comparison with the results of laboratory analyses of two of the samples, one from Davis strait and the other from Port Burwell.

DATE.	Hour.	LOCALITY.		PARTS IN 1000 OF SEA WATER.			
		Latitude.	Longitude	Temp.	Cl.	H.	A.
1908.		D. M.	D. M.	D.			
August 6.	1 p. m.	57 23 N.	55 26 W.	44.0 F.			0.112
" 8.	11.30	59 55	54 46	43.0	18.4		0.112
" 9.		61 10	53 43	42.0			
" 10.	8 00	63 23	53 26	42.0	18.3		0.116
" 11.	8 00	64 10	56 00	36.0			
" 12.	8 00	65 34	56 13	37.0	18.3		0.119
" 13.	8 00	67 25	55 50	38.5	18.3	0.65	0.115
" 14.	8 00	70 10	55 35	39.0	18.3	0.58	0.115
" 15.	8 00	72 02	56 40	39.5	18.3	0.58	0.119
" 16.	12 00	73 43	59 02	38.0			
" 17.	8 00	75 07	64 12	33.0	18.7	0.58	0.106
" 18.	12 00	Near Parker Snow Bay		36.0			
" 19.	12 00	20 miles south of Etah		34.0			
" 20.	12 00	Etah harbour.		38.0	15.0	0.58	0.101
" 21.	12 00	77 03	74 55	36.0	18.0	0.52	0.110
" 22.	9 00	74 55	78 33	36.0	18.7	0.58	0.112
" 23.	8 00	74 15	86 45	34.0			
" 24.	3 p. m.	Erebus bay, Lancaster sd. island.		33.0	19.0	0.58	0.119
" 25.	1 "	5 mls. N. of Griffiths.		31.0	18.2	0.58	0.110
" 26.	12 00	12 mls. E. of Byam Martin.		31.0	18.2	0.58	0.119
" 27.	8 00	Melville sound.		31.0	119.0	0.58	0.119
" 28.	8 00	Entrance to Winter harbour.		30.0	18.2	0.58	0.115
" 29.	8 00	Winter harbour.		30.0	18.5	0.58	0.110
Sept. 5-11.		" "	" "	29.5	18.0	0.58	0.112
" 15.		" "	" "	29.3	18.2	0.58	0.110
" 18.		" "	" "	29.4	18.0	0.35	0.120
Oct. 5-12.		" "	" "	29.5	15.9	0.26	0.080
" 16-29.		" "	" "	29.2	17.7	0.35	0.114
Nov. 2-7.		" "	" "	29.1	17.7	0.31	0.115
" 13.		" "	" "	29.1	18.2	0.31	0.116
Dec. 12.		" "	" "	28.0	17.2	0.31	0.110
Feb. and Mar., 1909.		" "	" "	27.8-28			
June 5.		" "	" "	29.5			
Aug. 1.		" "	" "	32.0	18.2	0.31	0.120
" 15.		Melville Sound.		29.8	18.1	0.31	0.112

Date.		Source of Water.	Cl.	H.	A.
Aug. 20, 1908.		Stream at Etah, Greenland. . . .	0.165	0.052	0.015
Sept. 9.		Ice from floe	0.35	0.105	0.02
" 18.		White floe ice.	2.0	0.065	0.025
" 19.		Blue floe ice.	0.35	0.04	0.025
Oct. 7.		"	0.35	0.033	0.019
" 12.		"	0.33	0.04	0.025
" 28.		Floe ice.	0.44	0.04	0.028
" 29.		"	0.41	0.033	0.025
Nov. 30.		Snow	0.028	0.065	0.015
Aug. 2, 1909.		Pool on ice where snow was deep . .	0.103	0.037	0.014
" —.		Pool on floe.	0.70	0.06	0.01
Sept. 16.		Stream at Port Burwell	0.07	0.065	0.067

DATE.	Hour.	LOCALITY.	TEMPERATURE.		Cl.	H.	A.
			Water	Air.			
1909.							
Aug. 1.....	.....	Winter Harbour.....	32.0	.....	18.2	0.31	0.120
" 15.....	11 00	Melville sd., Little Point.	29.8	.....	18.1	0.31	0.112
" 18.....	9 00	Byam Channel.....	29.0	23.0	18.7	0.34	0.118
" 19.....	3 p. m.	South of Byam Martin Is.	29.6	28.4	17.7	0.32	0.115
" 21.....	2 "	Byam Martin Channel...	30.2	28.0	17.2	0.31	0.112
" 23.....	12 30 "	Barrow Strait..	29.8	32.0	17.8	0.31	0.112
" 25.....	2 "	" "	29.0	33.0	16.8	0.28	0.111
" 29.....	6 "	Lancaster sound.....	30.8	30.2	17.2	0.26	0.111
" 30.....	10 00	" " Long. 85°					
		inlet.....	30.8	32.2	17.4	0.27	0.112
" 30.....	8 p. m.	Lancaster sound, off Admiralty inlet.....	31.6	32.4	18.1	0.31	0.115
" 31.....	8 00	Lancaster sound, off Navy Board inlet.....	31.6	32.0	18.0	0.32	0.112
Sept. 1.....	8 00	Navy Board Inlet-South..	34.7	36.5	17.9	0.32	0.111
" 1.....	3 p. m.	Eclipse sound.....	38.3	41.0	17.0	0.26	0.110
" 3.....	8 00	Ponds inlet.....	33.8	34.0	18.2	0.31	0.112
" 4.....	10 00	Baffin bay lat. 72. long. 72	38.3	38.0	18.8	0.32	0.106
" 5.....	11 00	" off c. Eglinton.	37.0	36.0	18.4	0.31	0.109
" 7.....	11 00	Davis strait, lat. 69 ..	35.0	35.0	17.1	0.32	0.116
" 9.....	7 p. m.	" at Cobourg I.	31.0	33.0	18.7	0.34	0.111
" 10.....	6 "	Cumberland gulf.....	37.0	34.6	18.2	0.32	0.111
" 11.....	6 "	" "	37.0	36.0	19.0	0.31	0.111
" 13.....	8 00	Cape Haven.....	33.3	39.0	18.9	0.33	0.115
" 15.....	12 00	Port Burwell.....	34.3	33.0	18.2	0.31	0.114
" 20.....	1 p. m.	Hudson strait.....	35.5	36.0			
" 24.....		Ashè inlet.....	33.6	36.0			
" 27.....	10 00	Atlantic ocean, lat. 58°...	34.5	36.0			
" 28.....	10 00	" " lat. 56°...	37.0	45.0			
" 29.....	10 00	" " lat. 54°...	40.4	42.0			
" 30.....	10 00	Belle isle strait.....	42.8	45.0			
Oct. 1.....		Gulf of St. Lawrence....	51.0	49.0			

The following analysis of sea water, taken by me from Davis strait and Port Burwell, was furnished by Mr. Eugene Haanel, Ph. D., Director of the Department of Mines:—

LOCALITY.—No. 1 Davis Straits. No. 2 Port Burwell.

Parts per 1,000.

No. 1, Chlorine.	Total Hardness as Ca CO ₃ .	Alkalinity as CaCO ₃ .	Specific Gravity.
17.3	31.3	0.118	1.02409
No. 2. ...17.2	.....	0.120	1.02399

M. F. CONNOR,
Chemist.

Animal Life on Melville Island.

Melville island, as previously mentioned in the report, is a region which supports considerable animal life. The land animals include the musk-ox, the caribou or reindeer, the Arctic wolf, the white fox, the Arctic hare, and the lemming. The Polar bear and various kinds of seals winter in the ice. Three birds, the northern raven, the snowy owl, and the ptarmigan—a northern species of grouse—remain all winter, and many additional birds come there to nest. The order in which the latter birds were seen to arrive was as follows: The snowflake, white swan, Brant goose, Lapland longspur, jaegers, glaucous gull, species of crane, king eider, sandpipers, red phalarope, other species of gulls and of ducks, and the guillemot or sea pigeon. These have been dealt with by Mr. Frank Hennessey, and mention will be made only of a few additional observations on their manner of life in this region, which were noted during the spring travelling.

Northern Raven.—This bird was seen upon our arrival at Winter harbour, and during each month of our stay, usually singly or in pairs. On May 26 five were seen together. They were seen also at Ponds inlet, the River Clyde, and at Port Burwell in numbers.

Snowy Owl.—Like the last, this is a bird of prey, feeding largely upon the lemmings. A nest found on July 10 contained seven young birds of different sizes, ready to fly early in August.

Ptarmigan.—Food consists of seeds during the winter, and chiefly of the buds of the dwarf willow during May and June.

White Swan?—Single bird seen flying north, high overhead, May 23.

Brant goose.—First flock seen June 3. Breeds on shores of small lakes, where the young were seen swimming, July 28.

King Eider.—Ducks that were unable to fly were killed with a hammer at the end of August. These were probably male king eider that had moulted their feathers.

Long-tailed Jaegar.—First nest found June 28, in a bunch of vegetation matching in colour the olive green base and brown spots of the two eggs. Others similar, and not easily seen.

Snowflake.—Nest of grass lined with feathers, placed out of sight underneath a stone. Eggs greenish-white, speckled with brown.

Lapland Longspur.—First seen at Winter harbour on June 4. Nests were found on June 29 which contained five eggs. Period of incubation is less than thirteen days.

Insects.—These are quite numerous during the short summer on Melville island, and include spiders, flies, bumble bees, butterflies, mosquitoes, &c. The requisite materials were not available for the preservation of insects or marine invertebrates—though these were included among the equipment already on board—and no collections were made of these forms of life.

Musk-ox.—This is the largest and most characteristic land animal of the Arctic regions of Canada. They form the darkest objects on the landscape, being distinguished from rocks by the intenser black of their shaggy coats. Yet their covering of hair is not entirely black in colour, that on the legs being light grey, and a patch on the back just behind the long hair of the mane almost as light in colour. In addition to this long hair, which is from one to three feet in length, they possess a thick covering of dark grey wool from six to eight inches in length. A more perfect protection against the cold could hardly be conceived. Nor have they anything else to fear in their native haunts, the spreading base of the horns in the male, and greatly thickened frontal bones, render a bullet in the head ineffective, and must be equally as good a protection against the attack of wolves. Upon being alarmed, they immediately form a line facing the approaching danger, and press so closely together that they may be seen stepping on each other's feet. The whizz of a bullet, a well-directed stone, or the sound of the human voice causes them to turn and gallop furiously; but they usually face about after the leader, and again form a line within a quarter of a mile. Their rate of running is about a mile in five minutes. Their distribution is over the northern mainland, all of the Arctic islands, and the northern part of Greenland. A perfectly white musk-ox cow with a black calf was seen by Mechem at Cape Smyth.

Reindeer or Barren-ground Caribou.—Contrary to the reports of the earlier Arctic explorers, this animal remains upon the northern islands during the winter. In fact no opportunity is afforded for it to migrate until the Arctic night is far advanced and the cold has approached its maximum intensity. The difficulty with which it is seen in the imperfect light, on account of the whiteness of its coat, no doubt led to the error of its supposed migration. Even in daylight at any distance over a mile, nothing can be distinguished from the surrounding snow, but the darker part of the animal's back; and this looks not unlike a small table without supports. In a fog they can usually be approached readily. Even on clear days in May their curiosity often leads them to approach one man when alone. Twice on May 5 herds of six and seven came so close that I threw my hammer at the leading buck to drive them away. One herd was approached from leeward and would have surrounded me if left alone; the other was approached from windward, and at first moved off, but circled and came within about 50 yards. The antlers are lost during the latter half of April, and the young are brought forth about a month later. These animals are distributed over all the Arctic islands. Tracks are frequently seen upon the ice, and herds have been seen crossing from one island to another. No tracks of the musk-ox have been similarly reported.

The single rodent—the lemming—as well as the fox and the wolf, for whom and the birds of prey it forms the chief food-support, have been fully dealt with by Mr. Hennessey. Possibly the observation of a large Arctic fox swimming from pan to pan of ice in Winter harbour, on August 5, in order to secure a meal from the garbage heap on a pan about 300 yards out, is worth recording.

Arctic Hare.—These fine animals are quite numerous about the deep ravines and rocky hillsides in the more elevated parts, and are found in odd pairs in the lower-lying land of these islands. They dress on an average at least eight pounds; but, possibly on account of their active life, the meat is rather tough. The fur is of a pure white colour, except at the tips of the ears, and so long and loose that it flutters in the wind. It is doubtful if they are surpassed by any animal in the power of

climbing cliffs. One was seen going without difficulty up a steep hillside 500 feet in height, the upper fifth of which was a bank of packed snow with an almost perpendicular face. The females bring forth their young—usually four in number—about the end of June.

Polar Bear.—This animal is found in all the northern waters which remain open to any extent during the summer, and upon the ice in the same region during the winter and spring months. Osborn mentions that both male and female bears—some of the latter followed by cubs—were seen on the ice at all seasons of the year, north of Wellington channel. Early in June he observed a female bear overturning blocks of sandstone on the east shore of Bathurst island, that her cubs might secure the lemmings underneath; and saw her suckle her young, sitting on her haunches and lowering her breasts that they might reach from their standing position. No traces of bear were met with by McClintock along the northern shores of Melville or Prince Patrick islands, but two were seen by Mechem on the south shore of the latter. Three males were killed by our sled parties south of Dundas peninsula during the second week of April, and on the 27th a female and cub destroyed the outfit of a party of three men near Cape John Russell, Banks island. On May 1, two females and three cubs were seen by us off Hearne point, Melville island. They would thus appear to bring forth their young in April. Judging from a personal encounter when unarmed, with one at this season, they do not appear to be a very vicious animal; but doubtless would be rough playmates if once they inflicted an injury. This animal was driven off by the sound of my voice and by blows from a hammer and prismatic compass.

Seal, Walrus, Porpoise, and Whale.—Seals have been quite fully dealt with by Dr. Low in his report. They are not numerous in the waters of Melville sound. A few Big seal and Harp seal were obtained at Winter harbour. They were first seen on the ice at Cape Hay on May 10. McClintock mentions seeing the first one in Intrepid inlet on May 20, 1853.

Walrus were seen in Barrow strait in the last week of August. Numbers of White whales or White porpoises were seen in Erebus bay, August 24. Narwhal are common about

Ponds inlet. Whales were rarely seen. The blow of a whale was reported off Hearne point in September, 1908. The first Right whale observed during the voyage was seen off the entrance to Navy Board inlet on the last day of August.

GAME killed in the vicinity of Winter harbour, 1908-9, and in the vicinity of Dealy island, Melville island, 1852-3.

	C. G. S. "ARCTIC."			"RESOLUTE" AND "INTREPID."	
	No.	Av. Wt.	Av. Wt.	No.	Av. Wt.
		1908.	1909.		Dressed.
Musk Oxen.....	55	253	265	112	166
Caribou.....	75	100	89	94	60
Hares.....	5	9	8	161	7
Ptarmigan.....	51	1	1	684	1
Wolves.....	4			3	
Foxes.....	60			52	
Bears.....	1			4	
Seals.....	7			2	
Water Fowl.....	96	2	2	388	2½

GAME procured by crew of *Investigator*, Mercy bay, 1850-53.

	No.	Av. Wt.	Total Wt.
		Dressed.	
Musk Oxen.....	7	278	1,945
Caribou.....	110	70	7,716
Hares.....	169	6	1,014
Ptarmigan.....	186	Not weighed..	
Ducks.....	198	" "	
Geese.....	29	" "	
Wolves.....	2	" "	
Bear.....	4	" "	
Total.....			10,675

GAME killed by Commander Peary in Ellesmere island.

—	1898.	1899.	1900.	1901.	1902.	1905-6.	Total.
Musk Oxen.....	17	38	215	12	6*	450	750
Caribou.....		*				50	50
Hares.....			1		100	162*	300
Ptarmigan.....						1	1
Seal.....		17	10			14	41
Walrus.....	1	*		128		16	270-300
				July-Aug.			
Bear....	3	1				1	5
Salmon.....						100 lbs.	.....
Foxes.....						25	25

* Indicates that the number is not complete or omitted. This summary is formed by totalling up the numbers given in Peary's 'Nearest the Pole,' and is not complete, especially for small game. From it are excluded the musk oxen mentioned as killed in Greenland, which number about seventy-five.

Evidences of Human Habitation.

No evidence of Eskimo dwellings were seen on the present voyage, but the early explorers mentioned ruined huts and caches in many localities. The first of these, seen by Sabine in 1819, and afterwards by McClintock in 1851, comprised the ruins of five or six habitations near the eastern point of Byam Martin island, about which were bones, antlers, and a piece of decayed fir. On the southeast shore of the same island a number of flat stones, among which were the skull of a musk-ox, the jaw-bone of a bear, and the antler of a deer, were found on a gravel ridge close to the beach. McClintock mentions the following on Melville island: The remains of three habitations on a low point on the western side of the entrance to Beverley inlet about which were bones of seal and musk-oxen. About two hours west of Palmer point, two circles of stone almost buried in the soil and covered with moss, near which in a collection of stones were the skulls of two musk-oxen; near Cape Phipps, stones arranged in an elliptical form, 5 feet by 8 feet, and nearly buried in the soil. In the southeastern part of Bathurst island, he found an old encampment at Cape Evans, a ruined village at Cape Capel, six ruined huts on the west point of Bedford bay, and one on the point on the east side of

Acland bay. All were thought to be very old, but of different ages, and not inhabited within two hundred years. In this connection, McClure thought much the same about the ruins seen in Prince of Wales strait, previous to meeting with the Eskimos near its southern entrance. The ruins above were described as each formed of a circle of stones with a much smaller circle nearby, the general form being oval with an extended opening at one end, and the size about 7 feet by 10 feet. They appeared to have been roofed over with stones and earth, supported by whale bones. An old Eskimo cache was seen near the head of Ommanney bay, Prince of Wales island, and a similar one on the largest of the Cheyne islands, in Queens channel. Along the western shores of the islands of North Devon and Ellesmere evidences of old Eskimo dwellings are quite numerous.

J. G. McMILLAN,

Geologist of the 'Arctic' Expedition of 1908 and 1909.

APPENDIX A.

THE PALÆONTOLOGICAL RESULTS OF THE DOMINION GOVERNMENT 'ARCTIC' EXPEDITION OF 1908-9.

(By LAWRENCE M. LAMBE, F.G.S., F.R.S.C., of the
Geological Survey.)

The fossils brought from the Northern Archipelago of Canada by the *Arctic* expedition of 1908-9 and submitted to me for determination are from the Silurian limestones of Beechey island and from rocks of Carboniferous age from Melville, Banks, Browne and Bathurst islands.

The following species are represented in Mr. McMillan's collection:—

A.—From the Silurian limestone of Beechey island, south end of Wellington channel.

1. ACERVULARIA AUSTINI (Salter).

Strephodes? Austini, Salter, 1852. Sutherland's Voyage, appendix, Geology by J. W. Salter, p. cccxxx, pl. 6, figs. 6, 6a.

Acervularia austini, Lambe, 1906. The Cruise of the Neptune, appendix IV, p. 322.

This species is represented by three specimens belonging to the collection made by Mr. McMillan. Three specimens, labelled Erebus bay, 1908-9, have also been received from Captain Bernier.

This species is now well represented by the joint material from Beechey island and vicinity brought south by the expeditions of 1903-4 and 1908-9 under Dr. Low and Captain Bernier respectively.

In appendix IV to Dr. Low's report the writer, in his reference to *Acervularia austini*, stated that *A. gracilis*, Billings, from the Silurian of Grand Manitoulin island, Lake Huron, might be found to be conspecific with *A. austini*, a difference in the size of the corallites being the sole character relied on for keeping them apart. The specimens now provided by the expedition of 1908-9 show that the range in size of the corallites of *A. austini* is considerable; this being the case, *A. gracilis* is probably best regarded as a synonym of *A. austini*.

2. STREPHODES PICKTHORNI, Salter.

Strephodes Picklhornii, Salter, 1852. Sutherland's Voyage, appendix, p. ccxxx, pl. 6, fig. 5.

This species is recorded, in the above mentioned work, from Cape Riley and Beechey island, Griffith's island and Cornwallis island. Mr. McMillan has been fortunate in obtaining eight specimens from Beechey island, the largest of which is over 50mm. long with a maximum diameter of about 25mm. The primary septa are seen, in transverse sections, to pass to the centre of the corallum, the secondary ones reaching rather more than half way. An outer vesicular area surrounds a definite central zone composed of rather larger dissepiments between the septa. The central area is equal in breadth to about one-half the diameter of the corallum and is clearly defined in the cup, forming a slightly convex floor at the bottom of the calyx. Within the central area the primary septa become slightly twisted. Whereas in the outer area the dissepiments curve regularly outward and upward, in the inner one they are much less regular and more disposed to curve inward and upward, becoming toward the centre more nearly horizontal and sometimes enlarged, simulating tabulae but being too small and irregularly disposed to be considered true tabulae.

The genus *Strephodes*, McCoy, is by some palæontologists regarded as not distinct from *Cyathophyllum* Goldfuss.

A single, silicified specimen from Erebus bay, showing the inside of the cup, has been received from Captain Bernier.

3. CRINOIDAL REMAINS (joints of stalks) and fragments of brachiopods. Nos. 5 and 8.

4. ?*ATRYPA RETICULARIS*, L. One small specimen. No. 7.

5. *ATRYPA PHOCA* (Salter).

Rhynconella phoca, Salter, 1852. Sutherland's Voyage, appendix, p. ccxxvi, pl. 5, figs. 1, 2 and 3.

The specimens from which this species was originally described by Salter came from Cape Riley (close to Beechey island), where it is a common fossil, and from Cornwallis, Leopold, Griffith's and Seal islands. The species is also figured in volume I of the Journal of the Royal Dublin Society, 1858, in Captain McClintock's 'Reminiscences of Arctic Ice-travel in Search of Sir John Franklin, with Geological Notes and Illustrations,' by the Rev. Samuel Haughton. The latter author here recognizes the true generic position of Salter's species and refers to it under the name *Atrypa phoca*. He also mentions the abundant occurrence of the species at Beechey island, Garnier bay, and other upper Silurian Arctic localities.

Mr. McMillan's specimens, numbering over a dozen, some of which were well preserved, are from Beechey island, Nos. 4 and 7.

6. ?*ORTHOCERAS*. Remains of two straight chambered shells; not determinable. (No. 5.)

Both specimens have a diameter above of about 10mm. There are nine septa in a space of 14mm.

B.—From Browne island, off southwest coast of Cornwallis island.

FAVOSITES GOTHLANDICA, Lamarck. One specimen 6 inches across, part of a corallum. No. 46. The specimen shows mural pores in the sides of the corallites, but spiniform septa have not been detected. The corallites have an average width of about 1.6mm. In limestone.

7. CRINOIDAL REMAINS, in two pieces of limestone. Nos. 46 and 47. The horizon indicated by the above coral is a Silurian one.

C.—From Melville island.

LINGULA MELVILLENSIS, sp. nov.

Over a dozen specimens in light grey shale. No. 28. Ravine about 7 miles northeast of Cape Providence. The species represented is apparently an undescribed one. It is of small size with a length about equal to that of *L. credneri*, Geinitz (Carboniferous of England). Some of the specimens resemble *L. latior*, McCoy, in general outline. It seems to approach closest to *L. melie*, Hall, described from the lower Carboniferous (Waverley group) of Ohio, from which, however, it is distinct.

The average dimensions of the shell are: length, 6mm., breadth, 4.5mm. The outline is subovate, broadly rounded anteriorly, more or less flattened at the sides, and obtusely pointed behind, the angle at the beaks being about 85° . The position of the greatest breadth varies, but generally it is slightly in advance of the mid-length. Well defined concentric lines of growth occur at intervals, with finer ones between them. Distinct but very delicate lines can be seen radiating from the beaks forward. The specific name *melvillensis* is proposed for these specimens which should be more fully described, and illustrated. Type, Geological Survey Catalogue number 10002.

Lingula melvillensis. One specimen in clay ironstone. No. 25. Ravine between Cape Hay and Cape Providence.

Two specimens are also preserved in the split surface of a clay ironstone nodule. No. 35. Winter harbour. The surface of this nodule shows glacial striations.

ESTHERIA CANADENSIS, sp. nov. The carapace-valves of a species of this genus occur in great abundance in clay ironstone obtained by Mr. McMillan from a ravine 4 miles northeast of Cape Providence. No. 30. In the two pieces of ironstone from this locality, the larger of which is roughly 6 inches long, 4 inches broad, and three-quarters of an inch thick, there are hundreds of valves of *Estheria* preserved. With these crustacean remains are a few *Lingulæ* and, in the smaller of the two specimens, in addition, the remains of a land plant. Recent *Estheriæ* inhabit fresh, and sometimes, but not often, brackish water, whilst *Lingulæ* are marine forms. The presence of a few shells of *Lingula* with numberless valves of *Estheria*, and indications of plant life, suggest a fresh water deposit probably subjected to an inundation from the sea.

The valves of the Melville island *Estheria* are rather high in

proportion to their length, and have a straight dorsal margin shorter than the total length of the valve. The beak is about one-third the length of the dorsal margin from its anterior end. The surface is covered with strong, rounded, concentric ridges, about twelve in number, at rather regular intervals apart. Finer ridges occur between the larger ones, in the ventral half of the valve where the former frequently replace the latter as the ventral margin is approached. The maximum depth is at about the mid-length of the valve. The ventral margin is broadly rounded. The anterior and posterior ends are evenly curved and incline inward above to meet the straight dorsal margin at an obtuse angle. The dimensions of an average sized valve are: length, 6mm., height, 5mm. In a large valve the measurements are: length, 7mm., height, 5.7mm.

This species of *Estheria* from near Cape Providence does not agree with any described species, so far as the writer is aware, and as it comes from well within the confines of Canada, the name *canadensis* is proposed for it. Type, Geological Survey Catalogue number 10000.

Estheria canadensis seems to most closely resemble *E. tenella*, a British Carboniferous form, figured by Rupert Jones in the Geological Magazine, vol. VII, 1870, pl. IX, fig. 16. Their proportions are somewhat similar and they both have a straight dorsal margin. Differences are seen in the position of the beak and in their size, *canadensis* being much the larger of the two. Both are concentrically ribbed. *E. dawsoni*, Jones, from the lower Carboniferous of Nova Scotia and of Scotland, is a distinct species.

The *Lingula* occurring with the above species of *Estheria* is referred to *L. melvillensis*.

A number of valves of the above species of *Estheria* were also obtained in shale from the bank of a ravine 6 miles northeast of Cape Providence. No. 26. In this shale also occur traces of plant remains.

CARBONICOLA ARCTICA, sp. nov. Three specimens of an undescribed species, apparently belonging to this genus, are from the point north of Chevallier bay, Liddon gulf, Melville island. They are in a dark reddish-grey argillite found loose on the beach.

This species seems to approach closest to *Carbonicola elegans* (Kirkby), described from the calciferous sandstone of Fife (lowest

Carboniferous) originally as a Pleurophorous (Quart. Jour. Geol. Soc., vol. XXXVI, 1880, p. 586), and later redescribed and figured by Wheelton Hind in his Monograph on Carbonicola, &c., Palæont. Soc., vol. XLIX, 1895, pl. II, p. 81.

The character regarded as one distinctive of a new species is the very marked angularity of the anterior end of the shell in Mr. McMillan's specimens. If this angularity were less decided the writer would not feel justified in pronouncing the specimens specifically distinct from *C. elegans*.

In *C. arctica* the shell is transversely elongated, with a slightly convex upper border. The beak is placed at about one-third of the shell's length from the anterior end which is small and very pointed. The shell increases slightly in height posteriorly. The inferior border is very shallowly excavated at the middle, and rounds up evenly at the posterior end, the posterior curve becoming flattened in its upper half. The outline of the anterior end above is straight. Descending obliquely from the beak it meets the moderate curve of the inferior border at an angle of 100° in line with the mid-height of the valve. The sculpture of the exterior consists of numerous fine, distinct, regularly disposed lines of growth, which meet the upper border almost at right angles. In other particulars, apart from the extreme angulation of the anterior end, this species seems to agree with the form from Scotland already mentioned.

As regards other characters shown by the Arctic specimens it may be stated that, the lunule is very strongly marked, that the anterior adductor scar is of fair size, deeply impressed, and close to the border, not far above the median angulation of the valve, and is bounded behind by a rib that shows in the cast as a deep vertical groove in front of the umbo. The bevelled inner edge of the superior border is well shown. A slight angulation is apparent in the valves, proceeding from the beaks diagonally downward and backward, and posteriorly the valves become slightly concave beneath the superior border.

Mr. McMillan's three specimens have the following dimensions: (1) length 16.5mm., height 9mm.; (2) length 16mm., height 8.5mm.; (3) length 14mm., height 7.3mm. In each specimen both valves are wholly or partially preserved; the test in places is broken away exposing in two specimens casts of the interior, and in the remaining one impressions of the outer surface. In all the specimens

the outline of the valves is clearly shown. Type, Geological Survey Catalogue number 10001.

It is to be regretted that these well preserved shells were not found *in situ*. It is probable, however, that the beds from which they came were not very far distant.

D.—Banks island.

Impure fossiliferous limestone at an elevation of about 500 feet, in a cliff 16 miles southeast of Cape Hamilton; collected by R. Pike. No. 34. In a small piece of limestone, labelled as above, are preserved fragments of a ribbed brachiopod, not generically determinable, and parts of tubes of what appears to be a *Syringopora*.

CEPHALOPOD. Not determinable generically. The fossil is from a piece of drift limestone, of a light yellowish-grey colour, from Winter harbour, Melville island, and is much worn and poorly preserved. The shell was straight, about 14 cm. broad, and apparently lenticular in section. The specimen is about 20 cm. (8 inches) long, and shows thirteen slightly concave septa, above which, occupying more than half the length of the specimen, is the body chamber. Probably about half the total length of the shell is represented by the fossil. No trace of a siphuncle can be detected. The general shape of the specimen, with its apparently lenticular cross section, and the curvature of the septa, strongly suggest the genus *Tripteroceras* known from the Galena-Trenton of the Lake Winnipeg basin and northward. The colour and nature of the limestone is also suggestive of the Galena-Trenton as the probable source of the specimen in question.

The invertebrate species collected by Mr. McMillan from strata on Beechey, Browne, Melville and Banks islands, give us the following results as regards geological horizons:—

A.—From Beechey island. Silurian.

The three species *Acervularia austini*, *Strephodes pickthorni* and *Atrypa phoca*, are already known from this locality and neighbourhood. The remainder of the Beechey island list, viz., a brachiopod, assigned with uncertainty to *Atrypa reticularis*, and joints of crinoid stems do not render much assistance as horizon markers. From what we already know, however, of the Beechey island fauna (see Appendix IV, Cruise of the *Neptune*, 1906), it is probable that the

fossiliferous limestones of this place are of about the age of the Niagara formation.

B.—*From Browne island.* Silurian.

The single species *Favosites gothlandica*, ranges throughout the Silurian, and on that account the limestones of this locality can be spoken of only in general terms, viz., as of Silurian age.

C.—*From Melville island.* Carboniferous.

The three species, *Lingula melvillensis*, *Estheria canadensis*, and *Carbonicola arctica* (the last named loose), although having a general Carboniferous aspect, are all described for the first time, and *C. arctica* was not found in place. The age of the beds from which the specimens come, although probably Carboniferous, cannot be more definitely determined with the material available.

With the specimens from Melville island are three or four fragments of a highly bituminous, dark-brown shale found loose on the surface of the ground 10 miles north of Cape Bounty. No. 22. This shale ignites when a flame is applied to it, and the unworn condition of the specimens indicates that they were probably not far removed from the beds from which they came.

D.—*From Banks island.* Carboniferous.

The few fossil invertebrates (shells, &c.) from this island are too fragmentary to be of any definite use as horizon markers. The rocks as here developed are generally understood to be of Carboniferous age.

In Dr. G. M. Dawson's map (1886)¹ of the northern part of the Dominion of Canada, and in that of Dr. A. P. Low (1905)² of Hudson bay and the islands to the north, is to be found, in graphic form, the sum of our knowledge of the geology of Arctic Canada, based on the results of the numerous expeditions to these northern latitudes.

Besides the invertebrates from Melville and Banks islands, Mr. McMillan obtained plant remains from the same islands and also from Bathurst island. These fossil plants, so far as their state of

¹ Notes to accompany a geological map of the Northern Portion of the Dominion of Canada: Geological and Natural History Survey of Canada, Annual Report, New Series, Vol. II., 1886 (1887).

² Report on the Dominion Government Expedition to Hudson Bay and the Arctic Islands on board the D.G.S. *Neptune*, 1903-4 (1906).

preservation will admit, have been determined by Mr. W. J. Wilson of the Geological Survey, who finds that they confirm the opinion generally held regarding the Carboniferous age of the strata of these islands. Of the specimens submitted to Mr. Wilson, all are poorly preserved except the fossil wood (No. 33) from Banks island. The results of his examination are as follows:—

From Melville Islands—

1. From foot of cliff north of Chevallier bay, Liddon gulf, a fragment of a calamite stem in fine, grey sandstone showing the inner cast of the bark but no nodes. It resembles *Calamites Suckovii*, Brongn. No. 38.

2. From a ravine $2\frac{1}{2}$ miles west of Winter harbour, a fragment of a carbonized stem in grey sandstone, too poorly preserved to be identified. No. 14.

3. From a ravine 4 miles northeast of Cape Providence, there are two specimens of clayey sandstone containing several fragments of plants, among them a fragment of a cordaite leaf and a coarse stem with the bark carbonized, probably a *Sigillaria*. No. 29.

4. Five specimens of grey sandstone, labelled Melville island, contain badly macerated plant remains which are indeterminable.

5. From a ravine 15 miles northeast of Cape Providence, a partly flattened plant stem in grey sandstone. Not determinable. No. 24.

6. From ravine 5–7 miles east of Chevallier bay, Liddon gulf, a worn stem, with markings somewhat resembling those of *Ulodendron*. No. 37.

From Banks island:—

7. Five and a half miles southeast of Cape Hamilton, a specimen of fossil wood showing structure. No. 33. Further study will be necessary to determine it.

From Bathurst island:—

8. Two miles east of Cape Hotspur, a specimen of sandstone with macerated fragments of plants wholly indeterminable.

Mr. Wilson is of the opinion that the above specimens, while too poorly preserved to be of value in the exact determination of geological horizons, have a decidedly Carboniferous aspect.

The following shells, belonging to living Arctic species, form part of Mr. McMillan's collection:—

From stratified sand, banks of ravine, 6 miles northeast of Winter harbour, Melville island:—

Mya. One specimen, fragment showing beak and part of hinge; probably *M. truncata*, L.

Saxicava rugosa, L. One valve 38mm. long

Astarte cfr. *borealis*, Schumacher. Four specimens.

From beaches of Melville island:—

Mya truncata, L. Two specimens.

Seripes grœlandicus (Gmelin). One valve.

Saxicava rugosa, L. One specimen, 47mm. long.

Fusus sabina, Gray. One specimen.

Astarte cfr. *borealis*, Schumacher. Three specimens.

Salter, as early as 1853, in his paper on Arctic Silurian Fossils in the Quarterly Journal of the Geological Society, vol. IX, mentions the occurrence of Pleistocene deposits with marine shells of existing Arctic species (*Mya truncata*, *Saxicava rugosa*, &c.) found on all elevations up to 500 feet on Beechey and Cornwallis islands.

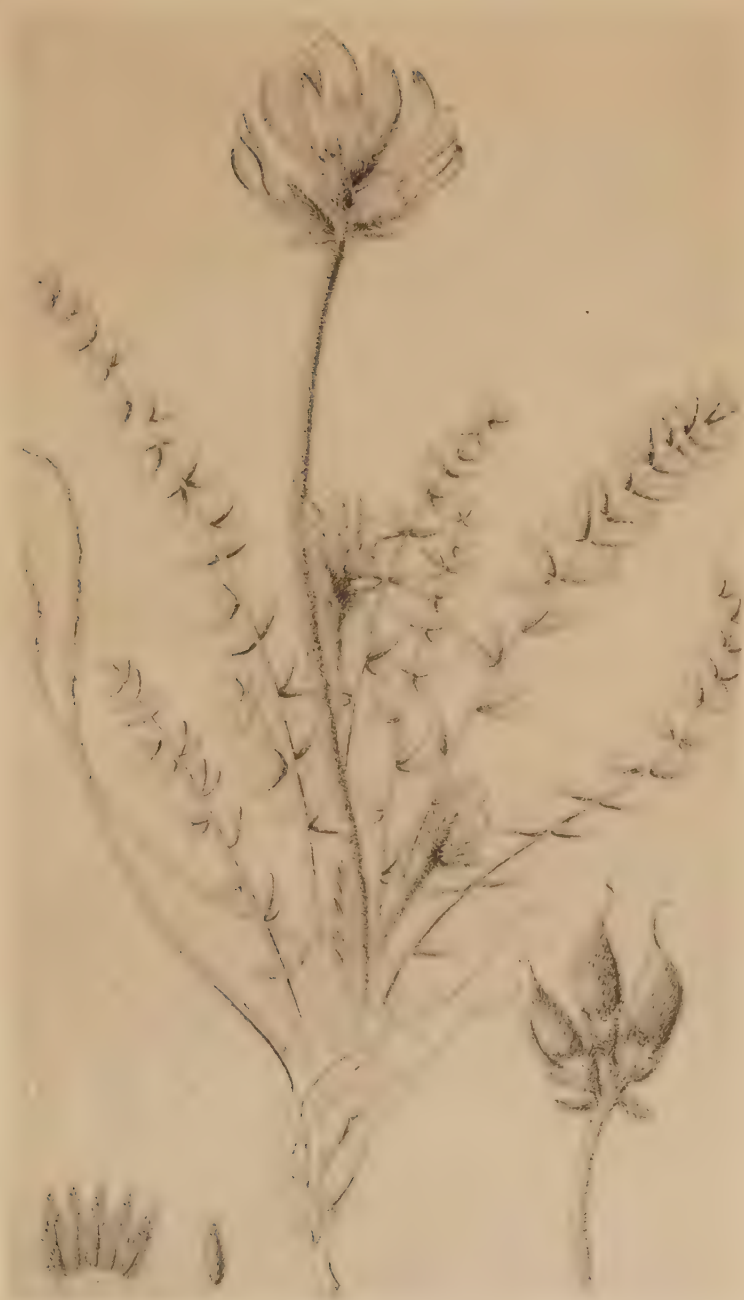
Samples of sea bottom from the following localities were also obtained by Mr. McMillan:—

No. 1. At a depth of 50 fathoms, off Matane, River St. Lawrence, fine clayey sediment with coarse quartz particles, in which were observed a few silicious, oxeote, apparently Monactinellid sponge spicules.

No. 2. At depth of 48 fathoms, 5 miles north of Griffith's island, Barrow strait, fine, yellowish-grey, clayey sediment, containing forams of one species only, so far as observed, viz, *Polystomella striatopunctata*, Fichtel and Moll., or a form much resembling it. This species is known from Arctic and North Atlantic waters, and is, according to Sir J. William Dawson, a characteristic fossil of the Pleistocene clays of Canada.

No. 3. In 8 fathoms of water, Winter harbour, Melville island, fine, grey sediment with tinge of red. No remains of life.

No. 4. In from 4 to 5 fathoms, Winter harbour, tenacious mud, dark from the presence of carbonaceous matter.



OXYTROPIS BELLII. (Britton.)

No. 5. At depth of 15 fathoms, 2 miles off Little point, Melville island, mud similar to that of No. 4. Holds a few sponge spicules resembling those of No. 1 locality.

No. 6. In 15 fathoms of water, 2 or 3 miles off Gillman point, Byam Martin island, tenacious, dark-grey mud, like that of Nos. 4 and 5; without trace of life.

APPENDIX B.

LIST OF PLANTS COLLECTED BY MR. J. G. McMILLAN ON MELVILLE ISLAND, IN THE AUTUMN OF 1908 AND EARLY SUMMER OF 1909.

(By J. M. MACOUN.)

The collection of plants made by Mr. McMillan on Melville island, though not large, is one of the most valuable contributions to the herbarium of the Geological Survey in recent years. Our collection of plants from Hudson bay and Hudson strait is by far the finest in any herbarium; in fact there are few plants from south of Hudson strait in any of the large herbaria of the world that have not been collected by members of the Geological Survey staff. The most important of these collections are those made by Dr. Bell, Dr. Low and the writer. Rich as our herbarium is, however, in specimens from Hudson bay and from the Arctic regions between Behring strait and the mouth of the Mackenzie river, we had no plants from the Melville island region, and Mr. McMillan's collection for that reason, if for no other, is of great value to us. It was not to be expected that any new species would be found anywhere in the north, but Mr. McMillan's collection contains some species that have not been collected for many years: *Ranunculus Sabinei*, one of the rarest of Arctic species, *Oxytropis Bellii*, described from specimens collected on Mansfield island by Dr. Bell, and *Pleuropogon Sabinei*,

which was described from the very place at which Mr. McMillan collected it in 1909.

Placodium elegans, Link.

Racomitrium hypnoides, Linn.

Ranunculus nivalis, Linn.

Ranunculus Sabinei, R. Br.

Caltha palustris, L., var. *arctica*, R. Br.

Papaver radiculatum, Rottb.

Arabis alpina, L.

Braya purpurascens, Bunge.

Cardamine bellidifolia, Linn.

Cochlearia fenestrata, R. Br.

Cochlearia Grænländica, Linn.

Draba arctica, Linn.

Draba Bellii, Holm.

Draba nivalis, Lilj.

Parrya arctica, R. Br.

Alsine propinqua, Richards.

Cerastium alpinum, L., var. *legitimum*, Lindb.

Cerastium alpinum, L., var. *lanatum*, Lindb.

Lychnis apetala, Hooker.

Stellaria longipes, Goldie, var. *læta* (Richards).

Oxytropis Bellii (Britton), Macoun.

Dryas integrifolia, Vahl.

Potentilla emarginata, Pursh.

Saxifraga cæspitosa, L.

Saxifraga cernua, L.

Saxifraga flagellaris, Willd.

Saxifraga Hirculus, L., var.

Saxifraga nivalis, L.

Saxifraga oppositifolia, L.

Cassiope tetragona, Don.

Pedicularis lanata, Willd.

Oxyria digyna, (L.) Hill.

Salix Grænländica, Lundstr.

Salix glauca, L.

Luzula confusa, Lind.

Alopecurus alpinus, Smith.

Festuca ovina, L., var.

Glyceria augustata, (R. Br.) Fries.

Pleuropogon Sabinei, R. Br.

Mr. McMillan also brought to the museum three specimens of birds which had been given him by Eskimos. They were the Great Northern Diver (*Gavia imber*), the Snowy Owl (*Nyctea nyctea*), and the White Gyrfalcon (*Falco islandus*). None of these birds are rare, in fact they are the characteristic birds of the region, but the skins are good, and we had before no specimens from north of Hudson strait.

METEOROLOGICAL OBSERVATIONS.

REPORT OF W. E. JACKSON, OFFICER OF THE METEOROLOGICAL OBSERVATORY, TORONTO, METEOROLOGIST OF THE 'ARCTIC' EXPEDITION IN 1908-1909.

The instrumental outfit consisted of one Green barometer (broken in transit); one ship's aneroid; maximum, minimum, wet and dry bulb thermometers; anemometer, wind vane and anemograph.

The instrumental shelter was placed on the upper bridge of the vessel at an elevation of $3\frac{1}{2}$ feet from the deck. The anemometer and wind vane were fixed at the top of the main mast 110 feet above the level of the sea. The ship's aneroid was installed in the main hatchway leading to the officers' quarters and about 5 feet above sea-level.

Observations were made at Winter harbour, Melville island, from the latter part of August, 1908, to the beginning of August, 1909.

Records were made at 8 a.m. and at 8 p.m., 75th meridian time, and at local mean noon. No reliable results could be obtained under the condition of prevailing low temperatures for relative humidity, vapour pressure or dew point, and the records for these conditions of the atmosphere are left out of the abstract.

The barometric records indicate two maxima and minima during the year. The principal maximum occurred in March and the secondary in November, while the principal minimum occurred in September and the secondary in December. The greatest monthly range of pressure was in October, and amounted to 1.63 inches, and the smallest range was in July, of 0.65 inches.

The barometer did not always prove to be a good indicator of approaching storms, during some of which it would remain almost stationary while wind velocities of 60 to 70 miles an

hour were being recorded. In nearly every case, however, sudden and rapid rising of temperature occurred.

Severe storms were most numerous during the period from November to April, attaining a maximum in February. During this month seven occurred in which velocities of over 40 miles an hour were registered, and in three of these velocities of over 60 miles. The most violent storm was centred on February 8, and the records show a velocity of 86 miles for a continuous hour and for a fifteen minute period at the rate of 100 miles an hour.

Thermometric records show a steady and gradual fall of temperature up to the end of December, when 56 below zero was recorded on both the 26th and 29th. A mild wave during the second week of January raised the temperature to 4 above zero, after which it again fell to a minimum of 52.5. Mild weather again occurred during the first and last weeks of March, followed in both cases by extreme cold. During this month the greatest mean daily range of temperature, amounting to 16 degrees Fahrenheit, was experienced. By the latter part of April the temperature began to rise, and continued to slowly advance until it reached its maximum on July 12 of 60, after which falling temperature accompanied by fog, sleet and rain set in.

During the months of September and October the sky is generally more or less clouded, but with the diminishing extent of open water the sky became clearer, until in December only 16 per cent of cloud was observed. Clear sky continued more or less until March, when the reverse conditions again held sway. In April, the steady cold weather was again accompanied by fairly clear skies, but with the increasing power of the sun's rays in May, the cloudiness again increased.

Snow fell during every month of the year but July, while in that month the only thunder storm occurred. Fogs were very frequent during the period of open water, accompanied usually by a drizzling rain or sleet.

The wind records show almost constant north-northwest winds from September to the end of February, when they became a little more northerly, but still continued fairly steady. In June the resultant direction was back again to the north-

northwest, but the winds are much more variable, while in July they are so extremely variable that the resultant velocity amounts to only 2:5 miles an hour from the north-northwest. The diurnal velocity curves deduced from the eleven month period indicate a minimum velocity at 8 a.m. local mean time and a maximum velocity at 8 p.m. local mean time.

Following is an abstract of meteorological conditions for Winter harbour from September, 1908, to July, 1909.

W. E. JACKSON,

Meteorologist of the 'Arctic' Expedition of 1908 and 1909.

TORONTO, December, 1909.

METEOROLOGICAL ABSTRACT FOR WINTER HARBOUR, MELVILLE ISLAND FROM SEPTEMBER, 1908 TO JULY 1909, INCLUSIVE.

Month.	Mean of tri-daily readings of barometer.	Mean tri-daily readings of temperature Fahrenheit.	Temperature Minimum and Maximum.	Mean daily range of temperature.	Absolute Maximum.	Absolute Minimum.	Per cent. of Cloud.	Precipitation snow.	NUMBER OF DAYS ON WHICH OCCURRED.					WIND.	
									Snow.	Rain.	Thunder.	Fog.	Aurora.		Mean Velocity.	Resultant Direction.
1908.	Inches.	°	°.	°	°	°		Inches.							°
September	29.922	16.45	15.78	9.96	31.0	-7.2	72.0	9.4	17	...	...	3	1	21.5	N. 21. 49 W.
October	30.126	4.14	2.70	13.20	24.0	-23.4	75.1	3.8	24	...	...	3	1	12.9	N. 58. 23 W.
November	30.179	-17.03	-17.08	12.37	19.8	-35.9	31.6	3.2	6	...	...	1	4	20.8	N. 23. 39 W.
December.	30.009	-36.93	-36.83	9.61	-5.2	-56.0	16.0	1.4	2	...	...	0	16	14.4	N. 39. 9 W.
1909.															
January.	30.016	-30.75	-30.85	12.90	4.0	-52.5	37.0	8.9	14	...	...	0	15	17.4	N. 29. 41 W.
February.	30.057	-29.31	-29.33	12.82	8.7	47.8	35.0	7.9	8	...	...	0	3	22.1	N. 33. 8 W.
March.	30.314	-12.49	-13.47	16.09	17.2	-39.0	59.0	9.3	19	...	...	3	3	16.4	N. 2. 55 W.
April.	30.165	-14.94	-15.40	15.09	6.3	-35.1	26.9	4.3	9	...	...	0	0	21.1	N. 28. 55 W.
May.	30.217	17.39	16.94	14.05	37.1	-11.0	70.0	10.8	19	...	...	4	0	15.5	N. 21. 12 E.
June.	30.105	30.69	30.53	13.75	53.2	9.7	43.8	0.4	7	2	1	6	0	16.1	N. 32. 12 W.
July.	29.956	40.75	41.13	14.38	60.0	30.0	52.6	.....	.....	6	1	6	1	12.8	N. 34. 48 W.

Magnetic Observations.

The instrumental outfit consisted of a Lloyd-Creek dip circle by Dover, a horizontal Force magnetometer by Barisch and Lomb, chronometers and hack watch, sextant and artificial horizon. These instruments were made available for use on the expedition through the courtesy of the Director of the Department of Terrestrial Magnetism of the Carnegie Institute of Washington, D.C.

Observations for the magnetic elements were made at all points where length of stay and conditions would permit. The following declinations were determined:—

Winter harbour.. . . .	— 97	17.6	East.
Point Griffiths.. . . .	— 120	18.1	"
Point Gillman.. . . .	— 128	45.4	"
Cape Hotspur.. . . .	— 145	58.5	"
Browne island.. . . .	+ 149	57.9	West.
River Clyde.. . . .	+ 75	19.4	"
Blacklead island.. . . .	+ 60	4.9	"
Port Burwell.. . . .	+ 44	1.3	"
Ashe inlet.. . . .	+ 52	31.4	"
Dealy island.. . . .	— 106	35.0	East.
Cape Bounty.. . . .	— 107	8.4	"
On shore west of Bridport.. . . .	— 106	1.7	"

W. E. JACKSON.

TABLE showing the mean height of barometer, with the temperature of the air on board H. M. ship *Investigator*, from August, 1850, to March, 1853.

Year and Month.	BAROMETER.			TEMP. OF AIR.			Mean Force of Wind.	Yearly Abstract.
	Max.	Min.	Mean.	Max.	Min.	Mean.		
1850.								
August.....	30·060	29·390	29·751	+50	+27	36·5	3·5	Barometer.
September..	·650	·470	·809	46	— 1	20·2	3·6	Max. 30·654
October.....	·180	·380	·861	24	22	0·2	2·0	Min. 29·160
November...	·270	·160	·739	7	32	—10·2	3·1	Mean 29·828
December..	·560	·480	·978	— 4	40	23·4	2·5	Temp.
								Max. +50
								Min. —40
								Mean —4·66
1851.								
January....	30·570	29·400	29·885	—15	—51	—32·5	.....	Barometer.
February...	·630	·030	·958	9	51	37·7	.....	Max. 30·750
March.....	·720	·338	·946	5	51	28·8	.....	Min. 29·030
April.....	·610	·410	30·037	38	32	4·8	3·1	Mean 29·934
May.....	·600	·560	·023	47	5	18·9	2·2	Temp.
June.....	·150	·470	29·837	53	27	36·1	3·5	Max. +52·0
July.....	·090	·450	·756	52	32	37·5	3·0	Min. —51·0
August.....	·400	·390	·865	52	21	37·6	2·8	Mean +1·58
September..	·270	·450	·876	43	1	24·6	3·1	
October.....	·200	·300	·877	26	—22	3·3	1·9	
November...	·750	·630	·097	10	40	—15·2	1·8	
December...	·810	·490	·046	11	44	20·0	3·5	
1852.								
January....	30·600	29·280	29·841	+ 8	—51	—27·3	3·4	Barometer.
February...	31·000	·070	·777	— 1	47	25·8	3·1	Max. 31·000
March.....	·000	·410	30·082	+ 5	52	28·4	2·0	Min. 28·970
April.....	30·430	·520	·164	31	38	1·4	2·5	Mean 29·906
May.....	·250	·600	29·987	37	25	+10·2	2·6	Temp.
June.....	·100	·430	·758	51	+11	31·5	3·1	Max. +52
July.....	·000	·370	·749	52	30	36·7	2·9	Min. —52
August.....	·170	·400	·816	52	19	33·2	2·9	Mean +0·05
September..	·100	·070	·785	38	— 4	20·1	3·6	
October.....	·300	·440	·986	16	33	— 5·6	2·2	
November...	30·680	29·460	29·978	9	—43	—16·5	3·1	
December..	·670	28·970	·944	— 4	48	26·1	3·7	
1853.								
January....	30·120	29·180	29·748	—10	—65	—43·9	4·05	Barometer.
February...	·580	·400	30·085	13	57	38·5	2·05	Max. 30·720
March.....	·720	·540	·048	+17	58	25·4	2·34	Min. 29·180
								Mean 29·960
								Temp.
								Max. +17
								Min. —65
								Mean —35·9

(Signed) ROBT. MCCLURE,
Commander.

The above table was found by Captain J. E. Bernier.

H. M. SHIP 'RESOLUTE,' WINTER QUARTERS,
DEALY ISLAND, July, 1853.

MEAN temperature of the air taken on the floe during the following months.

Months 1852-53.	Maximum.	Minimum.	Mean.	—
September.....	+ 29	+ 1	+18·8	Mean temperature be- tween 1st July, 1852, and 30th June, 1853: +0·79.
October.	18	—21	— 0·5	
November.....	11·5	27·5	12·7	
December... ..	17·5	35	26	
January.	9	54	36·16	
February.	10	44	30·42	
March.....	+16	46	19·17	
April.....	20	22·5	2·07	
May.....	40	+ 3	16·9	
June.....	40	21	33·04	

REPORT OF MR. FRANK HENNESSEY, ON THE BIRDS,
ANIMALS, CRUSTACEA AND FAUNA COLLECTED
ON THE EXPEDITION OF THE 'ARCTIC'
IN 1908-1909.

442 BAY STREET,

OTTAWA, November 25, 1909.

Captain J. E. BERNIER,

Commander, D.G.S. *Arctic*,

Dept. Marine and Fisheries, Ottawa.

SIR,—I beg to submit to you, herewith, my report on bird and animal life, crustacea, &c., and flora, and to, at the same time, furnish a list of the topographical sketches I made during the recent expedition of the *Arctic*.

The birds, &c., collected have been submitted to the Department of Marine and Fisheries.

I must here state that I am very much indebted to Mr. J. G. McMillan, Geologist of the expedition, for his assistance in identifying the birds; to Professor Andrew Halkett for the identification of crustacea, &c., and to Mr. James M. Macoun, Assistant Naturalist of the Geological Museum, for the identification of the flora.

I have the honour to be, sir,

Your obedient servant,

FRANK C. HENNESSEY.

Birds—Spring Arrival.

Notwithstanding the inhospitable and unfavourable conditions which prevail during the long, dark and dreary winter that reigns over the treeless tracts of the Arctic archipelago, there remain there, three of the feathered world, the Ptarmigan, Snowy Owl and Northern Raven. But, when the winter season passes the Snowflake heralds the approach of spring.

His appearance is succeeded first by the Snow Goose, then the Eiders, Loons and Brant, the last bird to arrive being the Old Squaw.

¹ **List of Birds Seen and Collected on the Third Voyage of the
'Arctic,' 1908-1909.**

7. Great Northern Diver (*Gavia imber*)—

A pair of these birds seen at Blackhead, Cumberland gulf, September 11, 1909.

9. Black-throated Loon (*Gavia arcticus*)—

A number seen in Hudson strait, September 20, 1909.

11. Red-throated Loon (*Gavia lumme*)—

A single bird seen in channel, south of Cornwallis island, August 29, 1909.

27. Mandt Guillemot (*Cephus mandtii*)—

Numbers seen in Hudson strait, September 20, 1909; seen sparingly throughout the voyage at almost all points.

31. Brunnich Murre (*Uria lomvia*)—

Seen along with the last in Hudson strait, September 20, 1909. Appear to be breeding on southern coast of North Devon island, where flocks of from five to fifteen could be continually seen flying seaward, or returning to the land, August 23, 1908.

34. Dovekie (*Alle alle*)—

Countless flocks of from five to twenty seen in the waters of Hudson strait, September 20, 1909. Very abundant along north Greenland coast, particularly at Etah. Also seen in Lancaster sound and Cumberland gulf. Seen sparingly on floating ice in Baffin bay.

35. Skua (*Magalestris skua*)—

Seen sparingly in Baffin bay, Lancaster sound, Barrow strait and Hudson strait. Plentiful at Port Burwell and Ponds inlet; they are a great source of torment to the smaller gulls which congregate in great numbers at these places, for the purpose of feeding on the refuse of the settlement.

¹ NOTE.—This list has been prepared in accordance with the system of classification adopted by the North American Ornithologists' Union.

36. Pomarine Jaeger (*Stercorarius pomarinus*)—

Abundant about Winter harbour, where they breed on the low, flat, marshy land in the neighbourhood, choosing the small mounds or slight elevations that abound in these places, upon which to rear their brood. The nest is a slight depression in the soil of the elevation and just deep enough to admit the eggs and breast of the bird. No material is used in its construction, but the bottom is covered with much loose soil and rubbish apparently blown in accidentally. These birds are more sombre and quiet in their near relations, by which they are chased and bullied in spite of their greater size. The first of this variety was seen to arrive in the spring at Winter harbour on May 29. These birds may be readily distinguished from any others of any variety, by their slow constant wing beats, straight line of flight, and principally by the prominence of their two long tail-feathers.

38. Long-tailed Jaeger (*Stercorarius longicaudus*)—

This is one of the most abundant of birds about Winter harbour, where they tyrannize all others of their tribe, including the Snowy Owl, and make known their presence by successions of sharp but not discordant cries. Like the Pomarine Jaeger, they make their nests in swampy localities and they are of the same construction. These birds, considering their size, are quite able to fight for and defend themselves, particularly when any intruder may happen to encroach on the locality in which their nests are situated; in such a case they have been known to even attack the Arctic fox. These birds seem to know their beauty, for when alighting in the water they take great care in keeping their tail feathers elevated to prevent them from getting wet. The first bird of this species arrived in the spring at Winter harbour on June 13.

42. Glaucous Gull (*Larus glaucus*)—

Left Winter harbour late in September. Arrived June 7, 1909. Seen only late in the fall and early in the spring, indicating that they must pass on farther north to a more suitable breeding ground.

45. Kumlien Gull (*Larus kumlieni*)—

A specimen of this variety was secured a little south of Griffiths island, August 26, 1909,

47. Great Black-backed Gull (*Larus marinus*)—

On July 18, three specimens of this variety were seen at Winter harbour.

51. Herring Gull (*Larus argentatus*)—

Very abundant south of Somerville, Browne and Griffiths islands. Seen at Beechey island, where they appeared to be breeding.

70. Common Tern (*Sterna hirundo*)—

Seen about Winter harbour in the spring; near Cape Bounty in the fall of 1908. Also seen in Byam Martin channel and south of Bathurst island.

86. Fulmar (*Fulmarus glacialis*)—

Very abundant in Lancaster sound, where numerous flocks dotted the water, amongst the small floating ice, August 23, 1909. Very numerous at Ponds inlet, where they fed on the refuse of the settlement; abundant also along eastern coast of Baffin land and Labrador.

154. Old Squaw (*Harelda Hyemalis*)—

A few flocks seen about the open water along shore; Winter harbour, July 10, 1909.

162. King Eider (*Somateria spectabilis*)—

Arrived at Winter harbour about June 10. At this time they frequented the small pools on the land which were caused by the melting snow. About July 10 they all disappeared, apparently having gone to some breeding ground; the males reappeared during the end of July, congregating in flocks about the water channel that fringed the shores of the harbour. In the fall of 1908 they commenced to leave Winter harbour at about September 10.

169a. Greater Snow Goose (*C. h. nivalis*)—

A flock of these birds was seen on the shores of Winter harbour on August 28, 1908.

173. Brant (*Branta bernicla glaucogastra*)—

Quite abundant about Winter harbour where, apparently, they breed. Arriving there about June 3, they seek the fresh water pools in the valleys.

222. Red Phalarope (*Crymophilus fulicarius*)—

Arrived at Winter harbour about the first of June. Seen also at Dealey island along with the Sanderling. August 31, 1909.

234. Knot (*Tringa canutus*)—

Arrived at Winter harbour about first of June. Judging from the actions of certain birds seen in that locality, they evidently breed there. Fairly abundant there, but not seen in any large flocks. Unlike most birds of their family, they frequented the higher ground rather than the lower.

240. White-rumped Sandpiper (*Actodromas fuscicollis*)—

A number of pairs seen about Winter harbour during months of June, July and August. Breed there.

241. Baird Sandpiper (*Actodromas bairdi*)—

Seen about Winter harbour, where it breeds.

248. Sanderling (*Calidris arenaria*)—

Common about Winter harbour. Breeds there. Also seen at Dealy island and in Cumberland gulf and Hudson strait. Arrived at Winter harbour June 1.

262. Buff Breasted Sandpiper (*Tryngites subruficollis*)—

Two pairs seen at Winter harbour where it most evidently breeds. Arrived about June 5.

270. Black Bellied Plover (*Squatarola squatarola*)—

A flock seen at Winter harbour, July 6, 1909.

302. Rock Ptarmigan (*Lagopus rupestris*)—

Common throughout the year at Winter harbour, but, undoubtedly the greater number of these birds go south for the winter. About the first of June the females begin to moult a brown plumage, the males moulting a little later in the season. By the first of May, the red wattles above the eyes are well advanced in growth, and do not diminish in size very greatly until the middle of September. It is during the month of May that these birds pair, and a flock of ptarmigan in the month of June is indeed a very unusual thing. These birds when resting or sleeping, always post one of their number as sentinel to keep watch. Whilst on their southern migra-

tion numbers of these birds took refuge on the ship as it passed through Hudson strait, September 25, 1909.

353. White Gyrfalcon (*Falco islandus*)—

In the fall of 1908 they were abundant at Winter harbour as they passed on their southern migration, but no birds of this specie were seen at Winter harbour after September 8, 1908, the day on which they left for the south. Also seen at Kekerton and Ponds inlet.

356. Duck Hawk (*Falco peregrinus anatum*)—

A single bird of this specie seen at Ashe inlet, Big island.

376. Snowy Owl (*Nyctea nyctea*)—

Very abundant at Winter harbour; this bird preyed principally upon the lemmings and ptarmigan that abounded there. They bred abundantly in that locality, the nest always being placed on a small dune, hillock or earth mound, of which there are many in that section. The nest itself was merely a slight hollow in the soil, no material being employed in its construction. A few small feathers clung to the earth in the bottom, but, judging from the quantity of quills and down with which the vicinity was strewn, those had accidentally been deposited there. The young snowy owl is covered with down of a dirty white colour and, gradually as the bird becomes older, this colour intensifies until it has attained the hue of a dark drab. The wing feathers then begin to show themselves, and are followed by those of the back and tail. The feathers of the feet and legs remain white through its career, and the bill and talons are much out of proportion to the rest of their body.

When the nest of this bird was disturbed, the male showed fight, whilst his mate, from her distant perch on a rock, gave vent to plaintive mews. The male would circle overhead, clapping his bill with astonishing rapidity thus causing much clatter, whilst all the time he gave utterance to hoarse woos.

These birds are equipped with wonderful powers of vision, and it is a difficult matter indeed for one to approach them to within reasonable shooting distance.

486a. Northern Raven (*Corvus corax principalis*)—

A number of these birds remained about Winter harbour throughout the winter season. In the spring, on one occasion the pierced

shell of a snowy owl's egg was found, and footprints about the same showed that the raven was in the habit of plundering nests. Seen sparingly throughout the voyage, but most abundant at Port Burwell and Ponds inlet.

534. Snowflake (*Passerina nivalis*)—

Common about Winter harbour, breeding in the higher rocky places. First arrival seen May 9. Also seen at Dealy island, Cape Hotspur, Griffiths point and Beechey island.

536. Lapland Longspur (*Calcarius lapponicus*)—

Very abundant about Winter harbour, where on their arrival they immediately set to work to construct a nest, and commence incubation. The nest is constructed of dry grasses, and is generally placed at the side of a tussock in a much exposed place. The female bird gathers her material whilst her proud mate follows immediately behind here, encouraging her on by the chant of his sweet lay. They have a bobolink fashion of descending in circles from a height on outstretched wings, at the same time pouring forth tunes to which all Arctic explorers are greatly indebted.

Birds Collected.

Classified according to American Ornithologists' Union System.

—	Sex.	Locality.
Pomarine Jaeger (<i>Stercorarius pomarinus</i>)..	♂ ..	Winter Hr., Melleville Island.
Longtailed Jaeger (<i>Stercorarius longicaudus</i>)	♀ set of 2 eggs..	" "
Kumleen Gull (<i>Larus kumlieni</i>).....	♂ ..	South of Bathurst Is.
King Eider (<i>Somateria spectabilis</i>).....	♂ x ♀ ..	Winter Harbour, Melville Island.
Brant (<i>Branta bernicla glaucogastra</i>).....	♂ x ♀ ..	" "
Red Phalarope (<i>Crymophilus fulicarius</i>)....	♂ x ♀ ..	" "
Knot (<i>Pringa canutus</i>)	♂ x ♀ ..	" "
Baird Sandpiper (<i>Actodromas bairdi</i>).....	♂ ..	" "
Black-bellied Plover (<i>Squatarola squatarola</i>)	♀ ..	" "
Rock Ptarmigan (<i>Lagopus rupestris</i>).....	♂ ♂ ♂ ♀ ♀ x ♀ ..	Winter Hr., Griffiths Pt. and Hudson Str.
White Gyrfalcon (<i>Falco islandus</i>).....	♂ ♂ x ♀ ..	Blacklead Island and Winter Harbour.
Snowy Owl (<i>Nyctea nyctea</i>)	♀ sets of 2 and 7 eggs, respectively.	Winter Harbour.
Snowflake (<i>Passerina nivalis</i>).....	♂ ♂ x ♀ ..	" "
Lapland Longspur (<i>Calcarius lapponicus</i>)...	♂ x ♀ set of 5 eggs.	" "

Animals.

The Arctic Wolf was fairly abundant on Melville island, numbers remaining about Winter harbour throughout the dark period of the year, where on different occasions, both bands and single beasts visited the vicinity of the ship. They travel in packs of from four to eight, but very frequently the single track of a large wolf may be encountered. The caribou suffer much from their attacks, and the many skulls and hoofs which are to be found scattered over the island give evidence, by their condition, of the ravages committed by these beasts. One would imagine that wolves, in this remote state, where they remain unharrassed by man, would be quite easily trapped, but on the contrary they displayed great cunning and craftiness by the way in which they avoided being caught, and indeed they were quite as ready to flee at the sight of man as is the coyote of the plains.

The Arctic Fox was abundant on Melville island and at Winter harbour, they were numerous enough to afford good and profitable sport for those engaged in trapping. When traps were first set, these animals were easily caught with an exposed snare and bait, but, after a number had thus suffered their fate, they became more and more difficult to capture. During the winter it is amusing to study the tale telling trails which these animals make on the snow; at this season, the deep, snow-banked valleys are the places they delight to reconnoitre. Here their tracks form lace-work, as they descend or mount the steep sides, and it is quite interesting to follow the trail as it leads into a flat hollow in which the tracks show where Reynard has made successsions of fruitless efforts to capture a lemming. At such times they also seek the large stones and boulders, which abound there, for the purpose undoubtedly of finding what traces others of their kind may leave.

They preyed principally upon the lemming, but this diet was varied by ptarmigan and Arctic hare. They refuse to eat the stomach of the lemming only, and it is curious to find these as they remain on the snow, and mark the place of a tragedy, like so many miniature tombstones.

Throughout the fall and winter the Arctic fox is quite lean, but as the month of March approaches, they become very fat.

This fat is of a very oily nature and lies between the vellum and the hide, but by the end of April it has condensed itself into a form much like suet. The fur is at its best during the months of January and February, but it very often happens that good pelts are secured even as late in the season as April. This is most likely caused by the winter coat of the young fox developing itself later in the season than that of the older animal, for it will be noted that the winter fur of the matured fox is superior in quality to that of the young.

Throughout the winter the edges of the ears and tips of the tail remain darker in colour than the rest of the coat. When about to lose its winter coat, the fur of the Arctic fox becomes woolly and yellowish on the under parts, and the back and tail turn bluish. The brown fur of the summer coat first appears on the face and legs of the animal, and the whitish fur of the back and sides is removed by the fox itself, by rubbing its sides against boulders, to which the fur may often be seen clinging. The young when born are of the same colour as the adults are in summer, but the fur is finer in both colour and texture. The claws of the young are tipped with white and their teeth are more slender and crooked than those of the adults. The mother fox shows the greatest of affection towards her young, which are, when born, very handsome and have soft and tender eyes, which, at the same time, express a cunning possessed only by that animal.

The Lemming is very abundant on Melville island, where on the low, moss-covered areas, the ground is penetrated in countless places by the entrances of their burrows. Their fore feet are armed with four claws. Two of these (the centre ones) are double and well adapted to burrowing, which they do with astonishing rapidity. The hind feet have five long, slender claws and a number of longer hairs; the claws are light in colour, and are semi-transparent. The ear of this rodent is not like that of other animals, this organ being merely an unprotected hole in the side of the head, with the exception that it is covered over with reddish hair. Its coat is a soft fur, dark drab in colour, but made to appear greyish according to the season of the year. The darkest part of the coat is a mark-

ing which extends along the back, whilst the lightest are the under parts.

They are very courageous, and make great and creditable efforts to defend themselves when attacked, by standing on their hind legs or lying on their back, all the time beating the air with their tiny paws in efforts to wound the aggressor; they also make use of their sharp and slender teeth in such a case. When attacked they give utterance to successions of squeaks and grunts which are quite in accord with their fat, rolling body as it tumbles about endeavouring to keep off the enemy. They readily resort to cannibalism when food is exhausted.

The Musk-ox is abundant on Melville island, where countless herds frequent the low ground on which grasses and moss flourish to some extent. They roam aimlessly about in herds of from three to twenty, but sometimes as great a number as forty will band together. Their great coat of hair is very long, sometimes trailing the ground, and frequently attaining a length of forty inches. The forequarters of this animal are much more powerful than the hinder, but appear much larger than they are really are by the presence of the woolly mane with which their shoulders are covered. So apparent is this, that a large bull, advancing toward a person, may be mistaken for two animals. Their coat, which is at its best from the month of November to that of April, is made to appear very odd looking in the spring, by the large clumps of wool that suspend from the hair and which it is at this time shedding. When enraged or suspicious the musk-ox expresses himself by frantically pawing the ground or the snow with his fore hoofs. They are an animal of great vitality, and indeed they must be so fitted to withstand the rigours of the severe winters to which they are subjected.

In the spring of the year the herds generally break up and the animals, especially the bulls, roam about singly, but, as the winter approaches, they again congregate in herds. The footprint of the musk-ox is very difficult to distinguish from that of the barren-ground caribou, but if the trail be on snow, it should be followed until the animal treads upon deeper parts, when it will be found that the impresson made by the caribou

will rest much nearer the surface than that of the musk-ox. If the imprint be on sand or in soft mud, it may be determined by the greater diameter of hinder part of the impression in the case of the musk-ox, and by the greater space between the two fore parts of the hoof in the case of the caribou.

The Barren-ground Caribou is very abundant on Melville island. The winter coat is quite white and the hair is long and very brittle; this coat is shed during the months of May and June, but it is not until the first of September that the summer coat is fully developed. When the white fur is first shed, a dark sepia coloured soft, short hair is revealed. This first occurs on the back, thighs and head of the animal. The fur about the eyes darkens and the eyelashes lengthen, which gives the eyes of the animal a very soft and cow-like appearance. When in the velvet, the antlers are covered with a soft, light chocolate coloured fur and are themselves very flexible and tender. The males in the summer frequent the coast, and are particularly curious and sluggish in their habits, whilst the females, which at this time remain farther inland, are very wild and fidgety. The summer coat when in its prime varies much in its colour, often assuming the most rich of umber and cinnamon shades.

The Polar Bear was seen at almost all points throughout the voyage. During the ship's stay at Winter harbour a number of these animals were killed in close vicinity to the vessel. By members of the expedition which went from the ship to Banks island, these animals were reported to be very abundant about the northern shores of the island just named.

Also seen to be quite numerous in Wellington channel and Baffin bay shore of Baffin land.

Seal were seen throughout the voyage, the varieties being: Jar, Harbour and Big seal, the former by far the most abundant.

Walrus were encountered at but few points throughout the voyage. On the evening of August 24, a number of these animals were seen as the ship lay near Browne island. A single animal also seen not far from Cornwallis island.

The Arctic Hare was very scarce about Winter harbour, but when expeditions travelled to the westward of that point, these animals became very numerous. They seem to prefer the loftier land and delight in the rougher and more rocky country.

Also seen in numbers near Cape Haven, Baffin land and at Big island, Hudson strait.

Fish and Crustacea.

Collected at Winter Harbour, May and July, 1909.

Five small fishes.

A number of crustaceans.

A number of Gastropod Mollusks in their shells.

A few Ophiurians.

An Annelid.

A small collection of shells.

Collected at Ponds Inlet, during expedition 1907, and left on board the ship:—

Small salmon.

A few crustacea.

Flora Collected at Winter Harbour.

- No. 1. *Saxifraga oppositifolia*, L.
2. *Saxifraga cæspitosa*, L., var. *uniflora* (R.P.B.).
3. *Ranunculus nivalis*, L.
4. *Dryas integirfolia*, Vahl.
5. *Draba Bellii*, Holm.
6. *Hesperis Pallasu*, (Pursh) Torr. and Gr.
7. *Cerastium alpinum*, L., var. *pulvinatum*, Simm.
8. *Papaver radicum*, Rottb.
9. *Salix artica*, L., var. *Brownii*, Andress.
10. *Oxyria digyna*, (L.) Hill.
11. *Oxytropis Bellii*, Britton.
12. *Potentilla emarginata*, Pursh.
13. *Pedicularis lanata*, Cham. and Schlecht.
14. *Braya purpurascens*, (A. Br.) Bung.

REPORT OF F. VANASSE, HISTORIOGRAPHER.

The report of Mr. F. Vanasse, Historiographer, will as far as can now be seen, appear as a separate publication on his return with the *Arctic* at the end of her present voyage.

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